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THE UNIVERSITY OF ALBERTA

AN ASSESSMENT OF THE ALBERTA INDUSTRIAL ARTS TEACHER
EDUCATION PROGRAM

by



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A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH IN
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ABSTRACT

The purpose of the study was to determine the extent to which Alberta industrial arts teachers perceived the value of their program of teacher education in developing the specialized competencies needed to teach industrial arts in Alberta secondary schools. Such information could be used to modify industrial arts teacher education programs that have prepared industrial arts teachers for Alberta schools.

A questionnaire was developed and distributed to all 414 industrial arts teachers in Alberta, of whom 331 (80%) replied. It was found that the majority had been educated in Alberta, nearly one half in the University of Alberta industrial arts teacher education program.

The study examined five research questions, and found that:

1. The majority of University of Alberta educated teachers perceived themselves adequately prepared to teach industrial arts to junior high school students, but inadequately prepared to teach industrial arts to senior high school students.
2. The majority of University of Alberta educated teachers perceived themselves adequately prepared to teach less than half of the seventeen industrial arts content areas.
3. The majority of University of Alberta educated teachers

who completed six or more industrial arts preparation courses valued their preparation higher, than did teachers who completed fewer content courses.

4. The majority of non-University of Alberta educated teachers perceived themselves adequately prepared to teach industrial arts to both junior high and senior high school students.

5. The majority of teachers educated outside Canada perceived themselves adequately prepared to teach half or more of the seventeen industrial arts content areas, while teachers educated within Canada felt adequately prepared to teach less than half of the seventeen industrial arts content areas.

The following recommendations were made:

That the Department of Industrial and Vocational Education at the University of Alberta establish a curriculum review committee charged with the responsibility to:

1. Ensure that the University of Alberta industrial arts teacher education program is planned to develop at least the competencies required of a beginning industrial arts teacher in Alberta. This purpose may be achieved by;

- a. identifying the competencies intended to be achieved via the industrial arts preparation courses,
- b. identifying the competencies needed to teach

- industrial arts in Alberta secondary schools,
- c. comparing both competency sets to locate incongruencies,
 - d. critically examining the incongruent competencies to determine those which should be developed within the University of Alberta program,
 - e. revising the competency content of all industrial arts preparatory courses to ensure program articulation and continuity,
 - f. requesting industrial arts course instructors to develop course content compatible with the achievement of the agreed competencies.
2. Regularly assess the industrial arts courses in order to ensure that pre-determined standards are maintained.
 3. Improve existing, and develop further communication links with the Alberta Teachers Association, Department of Education, School Systems and practising teachers in order that industrial arts information can be shared throughout the Province, thereby improving the stature of the discipline.
 4. Conduct regular follow up surveys of program graduates to monitor the perceived worth of the program.
 5. Determine whether entrants to the program should possess pre-determined industrial abilities as a pre-requisite.

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CHAPTER 1

INTRODUCTION TO THE STUDY

This study was concerned with the collection and presentation of data which may be used by decision makers involved with the selection and preparation of Industrial Arts teachers within the Province of Alberta. The data were collected during the 1975/76 school year from teachers who were implementing the Industrial Arts Curriculum prescribed by the Curriculum Branch of the Department of Education of the Government of Alberta. The teachers surveyed had received their preparation from a variety of institutions, one of which was the University of Alberta which currently has a mandate to prepare teachers capable of implementing this curriculum.

The major purpose of the study was to determine the extent to which each Alberta industrial arts teacher perceived the value of his program of teacher education in developing the specialized competencies needed to teach industrial arts in Alberta secondary schools. In the discussion of the findings emphasis was placed on the perception of adequacy which industrial arts teachers prepared at the University of Alberta had of the program which has been and still is operated by the Department of Industrial and Vocational Education at that university.

Irrespective of the location of his teacher education program, each Alberta industrial arts teacher is expected to teach the industrial arts content specified by the Department of Education. However, there is no legal requirement for the University of Alberta to ensure that its graduates possess the competencies needed to implement all the industrial arts school curriculum. Therefore, for the purpose of consistency in the study, the Department of Education has been regarded as the authority on Alberta industrial arts content, it being recognized that the University of Alberta program may not be designed to incorporate preparation for all of that industrial arts content.

The University of Alberta at Edmonton has been responsible for the preparation of industrial arts teachers since 1963 when the Department of Industrial and Vocational Education developed a program of industrial arts education which was designed to replace the program previously offered by the University of Alberta at Calgary. The intention of the new program was to prepare teachers capable of implementing a technology oriented industrial arts curriculum.

The University of Alberta program has continued for over a decade with little major revision or evaluation. The intention of this study was to assess the effectiveness of that program in preparing industrial arts teachers, and to

obtain information which could be used to modify the industrial arts teacher education programs which have prepared industrial arts teachers for Alberta secondary schools.

DEVELOPMENT OF INDUSTRIAL ARTS AS A SECONDARY SCHCOL SUBJECT

In Alberta, industrial arts is regarded as being that part of general education which 'is concerned with interpreting the world of work, with industry as a salient component, to all youth' (Curriculum Guide, 1969, p.2). The contemporary theory and practice of industrial arts education has been influenced by four types of programs: the Russian System, Swedish Sloyd, Manual Training and Manual Arts (Gallagher, 1963).

The Russian system was designed to train engineers and skilled workers to build Russian railroads. It pioneered the concept of teaching industrial skills to groups, as compared to teaching an individual. Instruction was formalized, and consisted of making a progressive 'series of exercise joints and models, designed to give practice in those trade processes in wood and iron which were needed by railroad builders ... most of the products (joints and models) were of no intrinsic value and contained no element of boy interest' (Friese and Williams, 1966, p.43).

Swedish Sloyd developed a person skilled in a variety

of arts, mostly wood. The system was introduced into Scandinavian schools in order to 'help raise the moral standards of boys, which were thought to have deteriorated with the advent of the factory system of production' (Frieze and Williams, 1966, p.45). This aim was achieved by the production of useful and interesting models, accompanied by completing a notebook which included sketches, mechanical drawings, and lists of operations. Some choice in model selection was permitted, and class instruction was supplemented by individual teaching.

According to Frieze and Williams, manual training had its beginning when Woodward established the Manual Training School of Washington University in 1879. The philosophy was based on the premise that the skills and habits developed by manual training could be transferred to academic areas. The course of study was a series of sequential problems to be solved by the use of woodwork and/or metalwork skills, and pupil interests were largely ignored. 'Provisions for individual differences began to appear during the end of the period in which educational handwork was called manual training' (p.47).

Manual arts grew naturally from manual training when the design aspects of objects to be made in the school shop became a part of educational handwork. The important contribution of manual arts was the development of the project method as a means of accomplishing learning. The

designing of a project was combined with the extension of school shopwork into trade, industrial, and craft fields other than woodwork and ironwork. This is indicated by the use of the term 'arts', which means several skilled handworking occupations.

From these beginnings the subject area of industrial arts has emerged, which, in Alberta is now primarily concerned with the development of 'an informed citizenry in a highly industrialized society' (Curriculum Guide, 1969, p.3). As Friese and Williams (1966) have noted, industrial arts is a branch of general education based on the idea that a wide sampling of industrial experiences is desirable in order to develop the ability 'to interpret, react to, and secure the greatest benefits from industry and its products' (p.48).

ALBERTA INDUSTRIAL ARTS TEACHER PREPARATION PRIOR TO 1962

In Alberta, the Department of Education was responsible for teacher training from 1906 to 1945 (Chalmers, 1967). The Calgary normal school offered some manual training coursework as part of its teacher training program until the University of Alberta established the Faculty of Education in 1945. At that time the present University of Calgary was a part of the University of Alberta and the preparation of Industrial Arts teachers was conducted mainly at the Calgary

campus.

Practicing teachers were able to complete industrial arts coursework during summer schools which were conducted by teachers who normally instructed at technical high schools. Later, university credit courses were offered by the Provincial Institute of Technology and Art at Calgary, and both the Technical High School and Victoria Composite High School at Edmonton, the latter arrangement providing the only industrial arts preparation for many of the teachers in northern Alberta (Harder, 1975). These systems continued until the University of Alberta opened its own industrial arts laboratories at Edmonton in 1963 (Smith, 1973).

The 1945 Department of Education Report stated that the University of Alberta at Calgary was the only one in Canada then able to prepare Industrial Arts teachers, at which time the basic program consisted of:-

B.ED. in INDUSTRIAL ARTS

FIRST YEAR

1. Ed. 102: Health and Physical Education;
2. Ed. 103: Principles of Education Applied to Industrial Arts;
3. Ed. 319-239: Mathematics and Science in Industrial Arts;
4. Ed. 142A: Industrial Arts - Mechanical Drawing;
5. Ed. 142E: Industrial Arts - Woodwork;
6. Ed. 142E: Farm Mechanics;
7. Ed. 175: Educational Psychology;
8. English 2;

SECOND YEAR

1. Ed. 202: Health and Physical Education;

2. Ed. 242B: Industrial Arts - Woodwork;
3. Ed. 242C: Industrial Arts - Electricity;
4. Ed. 242D: Industrial Arts - Metal Work;
5. Ed. 242F: Automotive Mechanics;
6. Ed. 260: (a) Mathematics, Science, English;
(b) Observation and Practice Teaching;
7. Ed. 261: Educational Administration;

THIRD YEAR

1. Ed. 313: Consumer Education;
2. Ed. 339: Industrial Arts - Historical Development;
3. Ed. 341B: Industrial Arts - Woodwork;
4. Ed. 341C: Industrial Arts - Electricity;
5. Ed. 341D: Industrial Arts - Metal Work;
6. Ed. 341F: Automotive Mechanics;
7. One Division A, B, or C option;

FOURTH YEAR

1. Ed. 460: Science and the Practice of Teaching
(a) mathematics and science
(b) practice teaching;
2. Ed. 492: Philosophy of Education;
3. Phil. 51: History of Ideas;
4. (Two senior options from
5. (Division A, B, or C. (University of Alberta
Calendar, 1946-47, pp.225/6)

The program at Calgary continued until 1963 when the Department of Industrial and Vocational Education at the University of Alberta began to develop a technology oriented program of industrial arts teacher preparation which was designed to replace the Calgary program.

DEVELOPMENT OF THE DEPARTMENT OF INDUSTRIAL AND VOCATIONAL EDUCATION AT THE UNIVERSITY OF ALBERTA

The Division of Vocational Education was established within the Faculty of Education at the University of

Alberta, in 1962. In 1963 the Division became the Department of Industrial and Vocational Education, and one of its major objectives was to develop and implement a program of industrial arts teacher preparation, which would supersede the industrial arts program then in operation at the University of Alberta at Calgary.

In the view of Ziel (1963) the Calgary program required extensive modification in order to meet the demands of a changing society. Ziel contended that the program was obsolete, for 'it recognized neither our theoretical heritage nor the challenge of the future' (p.17). His argument was that industrial arts had failed to keep up with the demands of a technological society. By 1964, the University of Alberta at Calgary began to phase out its Industrial Arts education program (University of Alberta Calendar, 1964-65, p.214).

Ziel's ideas were influential in the development of both the industrial arts teacher education program and the industrial arts school curriculum. He maintained that industrial arts could support and reinforce other academic disciplines, provide a synthesizing educational experience via the multiple activity environment, and provide both boys and girls with an understanding of the current world of work (Ziel, 1962).

A report to the Faculty of Education (Ziel, et.al., 1965) listed the following industrial arts objectives which

establish the purpose of the industrial arts program, indicate the relationship of industrial arts to general education, and indicate the subject matter for industrial arts:

1. to develop an understanding of the productive aspects of society.

2. to provide exploratory experiences in the various technologies prevalent in the world of work.

3. to provide an environment where students can reinforce and apply the academic disciplines.

4. to provide an introduction to the multiplicity of career opportunities (p.6).

The four objectives were to be achieved in a laboratory setting which physically represented the materials, machines and processes of present-day productive society. Interrelationships were to be learned by making products and completing experiments. The laboratory experience was intended to be a culmination of these interrelationships and reinforce both the need and meaning of academic disciplines. The purpose of industrial arts was to expose all youth to many areas of productive society in order that they could become competent and take full advantage of the school system offerings. Later, as adult citizens they should be able to master technology, rather than be controlled by it.

ALBERTA INDUSTRIAL ARTS TEACHER PREPARATION SINCE 1963

The new program promoted by Ziel became the official Industrial Arts program for Alberta. The Alberta Plan, as it became known (Cochran, 1970, p.74) shifted the emphasis

of Industrial Arts to the multiple activity environment which aimed to introduce both boys and girls to a wide variety of experiences designed to interpret a technological society. The program developed by the Department of Industrial and Vocational Education was designed for use in schools by grades 7 through 12 and intended to be taught in four sequential phases.

Phase I was intended to take place in a multiple activity environment and aimed to introduce students to the tools, machines, materials, and processes which are predominant in the areas of ceramics, graphic arts, plastics, woods, metals and electricity.

Phase II aimed to introduce students to the technologies prevalent in the world of work: power technology, power transmission, electronic technology, computer technology, graphic communications, testing technology, and mechanical technology.

Phase III aimed to develop an understanding of mans' changing role in a technological society, while

Phase IV aimed to provide an in-depth study of clusters of some of the areas studied in Phases I and II (Ziel, 1967, pp. 105/6).

However, the four phase approach was not adopted by the Department of Education, although the multiple activity strategy was accepted. The industrial arts curriculum was arranged to include the materials and technology areas

suggested by the Department of Industrial and Vocational Education.

The University of Alberta has had the responsibility of preparing teachers who were expected to be capable of teaching the industrial arts content as prescribed by the Alberta Department of Education Curriculum (Harder, 1967, p.95). Because teachers could receive initial certification after two years of preparation, the university program was geared to developing industrial arts teachers with both the necessary subject matter teaching skills and the ability to organize and manage multiple activity laboratories, within a two year teacher education program.

The program at Edmonton in 1964 was:-

B.ED. in INDUSTRIAL ARTS

FIRST YEAR

1. Ed.IA 203 and Ed. Adm. 261;
2. Ed. Psy. 276;
3. English 210;
4. Math 207 or 201;
5. Ed.IA 260;
6. Phys Ed. 218;

SECOND YEAR

1. Chemistry 230;
 2. Ed. C.I. 250;
 3. Physics 240;
 4. Sociology 202;
 5. Ed.IA 270;
- Certification: Interim Standard S Certificate

THIRD YEAR

1. Ed. Psy. 476;
2. Philosophy 240 or 246;
3. Physics 340;

4. Ed.IA 360;

5. Ed.IA 370;

Certification: Interim Professional Certificate

FOURTH YEAR

1. Ed. Fdn. 492;

2. Sociology 390;

3. Ed.IA 350;

4. Ed.IA 460;

5. Ed.IA 470; (University of Alberta Calendar, 1964-65, p.235/7)

The First Year course Ed.IA 203 'Introduction to Industrial Arts' examined past and present Industrial Arts theory; Ed.IA 260 'General Industrial Arts' was designed to develop basic knowledge and skills in the Phase I areas of ceramics, electricity, graphic arts, metals, woods, plus the organization and management of multiple activity laboratories for Grades 7-8.

The Second Year course Ed.IA 270 'Introduction to Technology' was designed to develop skills required to teach the Phase II technology areas of computer, electricity-electronics, graphic communication, materials and processes mechanical, plus organization and management of multiple activity laboratories for Grades 8-9.

The Third Year course Ed.IA 360 'Laboratory of Technology' was designed to develop Phase III understanding of the relationships between man and technology.

Phase IV requirements were covered by: Ed.IA 370 'Technology I' which was intended to develop increased competence in electronic and computer technologies; Ed.IA

460 'Technology II' which was intended to develop increased competence in the materials and power technologies; EdIA 470 'Technology III' which was intended to develop increased competence in the graphics communication and mechanical technologies (University of Alberta Calendar, 1964-65).

The program was organized on the basis of student exposure to the breadth of material and technology areas during the first two years, followed by depth in the same material and technology clusters for the final two years of the program. This format was similar to that suggested by the University for use in Alberta secondary schools. The program, which was the only one in the Province designed to prepare industrial arts teachers for Alberta schools, continued without major revision for eleven years.

In 1973, the requirement that new students to the Faculty of Education must complete either a four year B.Ed. degree, or a Professional Diploma after a degree, was instituted (University of Alberta Calendar, 1974-5). As potential industrial arts teachers were required to complete a full four years at the University before commencing teaching, the Department of Industrial and Vocational Education revised its teacher education program. Some factors which influenced the program changes were:

- the need to prepare a teacher within a two year time period ceased to exist,
- previous research had indicated a need to develop a

more satisfactory level of skill acquisition in industrial arts teachers, and

- the desire to develop technical competence prior to completing methodology courses (Gallagher, 1973).

As a result, entrants to the program after September 1974 are required to take the following four year sequence:-

B.ED. in INDUSTRIAL ARTS.

FIRST YEAR

1. Approved Non- Education full course equivalent
2. Approved Social Science full course equivalent
3. Technical Drawing-Design full course equivalent
4. EDADM-half year course
EDIND 200 series-half year course
5. EDIND 200 series-full course equivalent

SECOND YEAR

1. Approved Science-full course equivalent
2. Approved Science-half year course
3. EDPSY-full course equivalent
4. EDIND 200 series-full course equivalent
5. EDIND 391-half year course
Free Option-half year course

THIRD YEAR

1. Approved Science-full course equivalent
2. Approved Arts-half year course
Basic Education-half year course
3. Senior EDFDN-full course equivalent
4. EDIND 395/457-full course equivalent
5. EDIND 497-half year course
Free Option

FOURTH YEAR

1. ED PR-two full course equivalents
2. EDIND 477-half year course
Approved BUS ADMIN-half year course
3. Non-Education option
4. Free Option (University of Alberta Calendar, 1975-76, 73.4.3)

The content of the revised program is similar to its predecessor although differences occur in the naming and sequencing of courses. The ED.IA courses have been reorganized into EDIND (Education Industrial) half course units. Skill competencies are now developed during the first and second years, while teaching and organizational strategies are covered in the third and fourth years of the program in contrast to the superseded program, which developed skill competencies during the final two years.

Included in the 200 level EDIND courses are EDIND 211, 213, 233, 235 and 237, which are normally completed during the first and second years of the program.

EDIND 211 is a study of the processes and machines inherent in the metal and material testing technologies. EDIND 213 is a study of the processes and machines inherent in the wood, plastic and earth technologies. EDIND 233 is a study of energy conversion systems; and energy transmission and control. EDIND 235 is a study of the processes procedures and materials inherent in the graphics technologies. EDIND 237 is a study of the concepts and practices inherent in the electrical, electronic and computer technologies.

EDIND 391 is a synthesis of the content from the above five EDIND courses, while EDIND 395 is a study of the interrelationship of man and technology utilizing a simulated industrial environment. EDIND 412 is further

study of metals and materials testing. EDIND 416 is further study of woods, plastics and earths. EDIND 434 is further study of power technology. EDIND 436 is further study of graphics technologies. EDIND 438 is further study of electronic and computer technologies. EDIND 457 further synthesizing activities with content from the material and technology components of productive society. EDIND 477 is a study of the teaching of the interrelationships of man and technology. EDIND 492 is instruction and intensive practice in technical communication skills. EDIND 497 covers the development of curricula for industrial and vocational subjects.

Free options at the second, third and fourth years of the program may be utilized to complete further EDIND courses, if desired.

Currently, the Department of Industrial and Vocational Education perceives its mission as the preparation of personnel for professional teaching and educational leadership roles, within a variety of institutions. A position paper prepared by the Department in June, 1976, stated that its mandate was:

1. To prepare teachers of elementary, secondary and post secondary students.
2. To prepare teachers of adults, teachers in industry, specialized occupations and professions.
3. To educate and train teachers and leaders for

universities and teacher colleges.

4. To contribute to more effective industrial and vocational education through practically oriented research activities, and participation in professional organizations.

SUMMARY

Industrial arts has evolved into an established secondary school subject area, common to most Alberta junior and senior high schools.

The preparation of Alberta teachers of industrial arts was the responsibility of the Department of Education until 1945, when the Faculty of Education of the University of Alberta at Calgary accepted that function, and established a degree program in industrial arts. This arrangement continued until 1963, when the Department of Industrial and Vocational Education at the University of Alberta in Edmonton began to assume the sole responsibility for industrial arts teacher preparation in the Province, and began to implement a technology based program of teacher education.

This program attempted to develop teachers who could operate a multiple activity laboratory through Grades 7 to 12. It continued until 1974, when the program was revised to change both the sequence and content of the program

itself. The Department of Industrial and Vocational Education has recently re-affirmed that one of its major functions continues to be the preparation of teachers of industrial arts.

CHAPTER 2

REVIEW OF LITERATURE

As the study is concerned with examining the University of Alberta industrial arts teacher education program with respect to its perceived ability to develop the specialized competencies needed to teach industrial arts in Alberta secondary schools, the literature review focusses on three areas. Literature relevant to industrial arts education in Alberta is examined in order to become acquainted with research undertaken in this field. Then an investigation of contemporary thought on curriculum evaluation and questionnaire design is conducted in order to develop a knowledge base which will aid in the development of the research design for the study.

RESEARCH CONCERNED WITH INDUSTRIAL ARTS IN ALBERTA

Several studies have been conducted under the sponsorship of the Department of Industrial and Vocational Education, for the purpose of developing and improving the curriculum, content and methodology of Industrial Arts at the teacher education level of application.

Alberta Industrial Arts Teacher Education Studies

A position paper by Ziel, Tichenor and Gallagher (1965)

predicted that industrial arts would expand rapidly in Alberta. It was felt that an anticipated increase in the number of program entrants, plus the need for additional expertise, would lead to the need for a minimum of three years of university preparation before initial teacher certification could be granted.

At the same time a five year developmental study was initiated for the purpose of refining the objectives, curriculum and learning activities of Industrial Arts for subsequent use by the University and secondary schools. The Edmonton Public and Separate School Boards, the Northern Alberta Institute of Technology (NAIT), the University of Alberta, and the Alberta Department of Education participated in the study (Ziel, LeBlanc and Manuel, 1966). The school boards provided students for the study, the Department of Education equipped the industrial arts laboratories, NAIT provided laboratory space and equipment maintenance, while the University provided instructional staff.

The research plan covered three developmental stages:

1. Feasibility phase: to determine applicability and potential of further investigation in selected program aspects.
2. Developmental phase: to provide opportunity to isolate, clarify and sophisticate variables and factors for evaluation in the next phase.

3. Experimental phase: aimed to test all the developed media, methods, content and equipment combinations of the previous two phases, to satisfy experimental research criteria.

Grade 8-9 students were taught identical school subjects, except that the experimental group received multiple activity industrial arts as the treatment variable. The experimental sample consisted of five groups of students, each having 18 to 22 members.

Group 1 was grade 9 boys, low achievement pupils,
Group 2 was grade 8 boys, average achievement pupils,
Group 3 was grade 8 girls, mixed achievement pupils,
Group 4 was grade 9 boys, lowest achievement pupils,
Group 5 was grade 9 boys, high achievement pupils.

Unfortunately, information relating to individual sample size, research design and statistical methods employed was not included in the report which summarized the project in 1966, and no further reports have been located.

The industrial arts treatment was designed to include a wide variety of teaching methods plus a unique combination of instructional hardware, including individualized instructional apparatus such as teaching machines, single concept loop films, audio tapes etc. At the end of the first year of the project, the Department of Industrial and Vocational Education published Research Report I (Ziel, et.al., 1966) which stated that the individual groups showed

improvement in the following subjects:

Group 1 - reading, literature, language and social studies,

Group 2 - language,

Group 3 - math and science,

group 4 - math concepts, word comprehension,

Group 5 - all academic areas.

It was concluded that the academic improvement had occurred as a result of the multiple activity experience during the year. Subsequently, the laboratory space at NAIT became unavailable, which caused the project to terminate in 1968.

Another five year project was then initiated which involved both Edmonton school boards and the Department of Industrial and Vocational Education at the University of Alberta. Each school board had some of the industrial arts equipment which was at NAIT moved to one of their own junior high schools. The Department of Industrial and Vocational Education promoted this project (Young and Wilson, 1970, p.12) which aimed to develop an industrial arts curriculum, determine methods of industrial arts curriculum evaluation, and to develop evaluative criteria for student performance. Problems soon arose, as several items of instructional machinery were found to be inoperative when received at the schools. In addition, a detailed master plan for the project was lacking. Young and Wilson stated that:

1. The agreements between both school boards and the university should have been more specific.
2. The teachers in the schools should have been involved in the project planning process.
3. Communication between the schools and the university should have been routed through only one channel,
4. Objectives for the research project should have been realistically set.
5. Evaluative procedures should have been built into the project.
6. Data resulting from the project should have been regularly documented.
7. Areas of responsibility for specific aspects of the project should have been clearly delineated (p.26/27).

Dryenfurth (1970) also investigated the same joint project, and found major weaknesses in the following aspects:

1. Both the junior high school students and their instructors were not fully informed as to the purpose of the project.
2. The Department of Industrial and Vocational Education did not provide the support required (and agreed to) in order to maximize the probability of successful completion.
3. Some of the instructional equipment was defective.

Dryenfurth recommended immediate termination of the

project until a detailed research curriculum model was developed for possible use at a later date.

In 1968 Gallagher surveyed secondary school teachers who had completed some of the Department of Industrial and Vocational Education's courses. He found that most were teaching a wide variety of subjects outside their industrial arts or vocational specialty. He recommended that another study be done to ascertain whether a trend was developing for such teachers to teach outside their specialization.

A survey of 82 industrial arts student teachers at the University of Alberta (Petruk, 1969) sought their opinions on the relative importance of the materials areas used in industrial arts (woods, metals, plastics, graphics, electricity and ceramics), and of their relationship to the major objectives of industrial arts. The research instrument was based on Thurstone's matched-pairs model, and was administered to all industrial arts students at the University of Alberta during Winter session 1968-69. First year students rated metals and woods as most important, while ceramics and graphic arts were rated as being least important to the major objectives of industrial arts. Second year students rated electricity and metals as most important, while ceramics was rated as least important. Senior students rated plastics and metals as most important, and placed woods and ceramics in the least important category. All student groups rated metals as the second

most important area, while ceramics was consistently rated as being less important to the major objectives of industrial arts. Petruk recommended that the (then) existing industrial arts program be critically examined.

Lewchuk (1970) conducted a survey of 50 randomly selected Alberta industrial arts teachers to determine whether industrial arts teachers held common views regarding the characteristics of a productive society. He found that no predictable pattern emerged, and that teachers could not agree on the importance of the characteristics of a productive society. Doubts were expressed that teachers knew what a productive society was. He concluded that industrial arts content was not meeting its objectives in providing teachers with an understanding of the changes occurring in a productive society.

During 1972, LeBlanc surveyed 450 persons who were teachers, and had taken some of the Department of Industrial and Vocational Education's coursework between the years 1962-71. His purpose was to evaluate the department's offerings, with a view to obtaining data which could lead to revision and subsequent improvement. LeBlanc stated that "the follow up study related here is the first attempt which has been made to contact all those who have been associated with the Department" (p.2). The questionnaire return rate was 66.5%. Of the teaching respondents, 25% taught industrial arts and 75% taught vocational subjects. Most

industrial arts teachers were involved with the areas of ceramics, drafting, electricity/electronics, graphic arts/communications, metals, plastics, woods and sheet metals, in that order. A few respondents were teaching power mechanics.

Judgments were also obtained regarding the value of Department of Industrial and Vocational Education's courses and subject matter.

Results indicated that teachers:

1. felt they lacked knowledge about children,
2. had inadequate knowledge about themselves,
3. recognized the importance of effective communication with students, but lacked expertise,
4. did not feel that the courses received adequately prepared them to organize and run a multiple activity laboratory,
5. wanted greater emphasis placed on teaching methods within the laboratory class setting.

Comments from teachers suggested that industrial arts preparatory courses be taught by skilled instructors and that more stress be given to methodology and curriculum development. Also, the need for a safety and first-aid course was noted, as was a desire for a longer period of student teaching.

At the request of Department of Industrial and Vocational Education, the organizational structure of the

department was investigated (Preshing, 1972). Included in his report was a recommendation that a formalized curriculum review function be established to include student evaluation of courses, plus external evaluation, on a cyclical basis.

Clark (1974) followed up this report by investigating the feasibility of implementing Preshing's recommendation. He summarized various evaluative strategies, and suggested the formation of "an ongoing committee of departmental faculty (or at least those members involved with the courses under review), which would hold monthly meetings to consider the findings of the evaluation procedures, and initiate the required revisions" (p.4).

Ible (1974) attempted to locate problems experienced by beginning industrial arts teachers during their first three years of teaching. His sample consisted of 72 industrial arts teachers who had been prepared at the University of Alberta between one and three years previously, and who were teaching in Alberta during 1973/74. Useable responses were obtained from 52 teachers, 12 of whom had taught for three years, 20 for two years and 20 for one year. His findings indicate that the teachers surveyed had experienced a wide variety of problems, but they were not difficult to solve. The most common problem areas identified were effectively dealing with evaluation, teaching aids, materials and resources. He reports that third year teachers perceived more problems than did first or second year teachers; also

rural teachers experienced different problems than did urban teachers. Those teachers without a B.Ed. in Industrial Arts had a wider range of problems than did teachers holding the degree. Ible suggested that the Department of Industrial and Vocational Education should recommend a course in evaluation or test construction for its students, and also place greater emphasis on the categories of instructional aids, material and resources in its curriculum and instruction laboratory courses. He further recommended that the Department of Industrial and Vocational Education should consider ongoing research directed at the type of problems that graduates face when commencing teaching.

A study by Bushrod (1974) used the Delphi technique with 73 participants (two from the Department of Education, 11 from the University of Alberta, 30 practising industrial arts teachers, and 30 undergraduate industrial arts students at the University of Alberta), in an attempt to identify the role of industrial arts educators in relation to the changing demands of society. Opinions received led him to conclude that:

1. It is desirable for industrial arts to place emphasis on the study of the social and cultural aspects of technology, and of its total effect on man.
2. That industrial arts will increase in significance in future school curricula, and as an integrative agent.
3. There will be a trend away from the project method as a

teaching vehicle.

4. There will be a move away from the small group format.

5. Industrial arts teachers will have to draw on the expertise of industrial personnel and technologically based industry as both a teacher and a classroom.

Haywood (1975) surveyed 90 Alberta industrial arts teachers (20% of the population) and observed that the respondents held similar perceptions as to the goals, competencies and content areas of industrial arts teacher education.

His study indicated that:

1. The following goals were perceived to be important

- to develop and manage an industrial arts laboratory,
- to be interested in children,
- to be able to express ideas to others,
- to be able to encourage children to enquire, experiment, and analyze.

perceived to be of less importance were

- the ability to understand the community and its resources,
- the desire for further study and professional growth,
- the achievement of emotional and social adjustment,
- an understanding of professional ethics.

2. The following competencies (sic) were perceived to be important

- skill in the use of machines and equipment,

- skill in teaching industrial arts,
- an appreciation of industrial arts as a part of general education,
- skill in the use of hand tools.

perceived to be less important were

- to be able to interpret a productive society,
- an understanding of career guidance,
- an understanding of industrial design,
- the ability to create and interpret mechanical drawings.

3. The following content areas were perceived to be important

- woodwork,
- graphics,
- power technology,
- electronics.

perceived to be less important were

- production science,
- industrial design,
- arts and crafts,
- industrial ecology.

The study recommended that further research be conducted to ascertain-

- a. the subject matter of industrial arts content areas,
- b. the specific teacher competencies needed to teach

these content areas,

c. the effectiveness of the present teacher education program in preparing both junior and senior high school teachers for Alberta schools,

d. whether the University of Alberta Industrial Arts content courses meet the perceived needs of its teacher graduates.

A study by Hache (1975) investigated the opinions held by industrial arts teachers towards the introduction of environmental education content into the present multiple activity industrial arts education programs. A list of environmental education concepts was presented to 20 randomly selected teachers. During personal interviews, it was established that although 87% of the sample accepted the concepts, only 12% of the identified concepts were used in industrial arts programs. Hache found that teachers agreed that the multiple activity approach to industrial arts education was flexible, but that little environmental education content was being developed in industrial arts. He concluded that a lack of suitable software was the major factor which inhibited the introduction of environmental education content into industrial arts education.

The preceding studies were concerned with research in industrial arts teacher education, while the remainder of this section deals with industrial arts research within the school setting.

Alberta School Related Industrial Arts Studies

A study by Manuel (1968) investigated the claim that industrial arts can reinforce academic disciplines, specifically grade nine science achievement. The sample consisted of 42 grade nine girls arbitrarily split into two groups. The experimental group received Phase II industrial arts (awareness of technologies) as the treatment variable while the control group completed the regular home economics program. It was hypothesized that the experimental group would obtain similar results to the control group as evidenced by the Department of Education Grade 9 science exam. Statistical analysis supported the hypothesis. In discussing the study Manuel indicated that the items designed to test for learning representative of the highest three levels of Bloom's Cognitive Domain (1965) were answered significantly better by the treatment group than by the non-treatment group. Manuel concluded that a randomized method of sampling may have strengthened the reliability of the study, as the groups were poorly matched.

LeBlanc (1968) developed an instrument to measure whether junior high school industrial arts students had an understanding of Alberta industry. The experimental sample consisted of: 24 grade seven boys, 23 grade eight boys and girls, and 20 grade nine boys and girls, while the control sample was matched to the experimental sample on the basis of academic achievement. The experimental groups received

industrial arts instruction at the university laboratories, while the control groups were taught industrial arts (boys) or home economics (girls) in the normal school setting. The experimental group had significantly better knowledge of Alberta industry at the grade 7-8 level, but no difference was observed at the grade 9 level. LeBlanc's instrument was judged to be a useful aid to evaluate one of the aims of industrial arts education, namely, to teach an understanding of the world of work.

An attempt was made by Wright (1970) to identify the strengths and weaknesses of the manner in which the Alberta junior high school graphics curriculum was implemented. The evaluation model developed by Stake (1967) was used in the study. Descriptive data relative to the activities of both teacher and students were obtained, while a committee of judges established standards of excellence, which were used together with the descriptive data, as a basis of evaluating the instructional program. The study concluded that the low student achievement observed resulted from teacher misinterpretation of the planned curriculum. Recommendations were made that the curriculum guide be made more specific by the inclusion of behavioral objectives, and that the teaching methods and concepts to be taught be more clearly stated.

Liu (1970) tested the effect of industrial arts on grade nine girls' mathematics achievement. The sample

groups were located at four randomly selected schools (N=112), while the treatment and non-treatment samples (n=34 and 78 respectively) were assigned on the basis of female students taking or not taking industrial arts as an option subject. Each school offered a differing cluster of industrial arts activities to female students, although the areas of ceramics, graphics and plastics were common to all programs. Statistical analysis of the students' grade nine mathematics results revealed no significant difference between groups. Liu concluded that the failure to confirm that industrial arts had a positive effect on mathematics achievement was due to:

1. the girls chosen for the sample were not exposed to all the areas within the industrial arts laboratories,
2. the students only received industrial arts education for a short time period (seven months or less),
3. the teachers involved in the study may have lacked experience in teaching industrial arts to female students.

Liu did not include the possibility that Industrial Arts may have no effect on mathematics achievement.

A study by Anderson (1972) hypothesized that the majority of students taking the electricity component within the junior high school curriculum were apathetic towards that area. In an attempt to improve student reaction to the learning of selected electrical concepts, Anderson developed

a new unit based on the electrical system of a car. Anderson reported that some student learning of electrical concepts had occurred, but felt that several of the activities were too research oriented, rather than 'hands on' oriented. This in turn contributed to an apparent decrease of learner interest. He suggests that the use of part of an automobile chassis may be of value in teaching junior high school electricity concepts.

To recapitulate these findings, it has been noted that the extended joint study (Ziel, et.al., 1966) revealed a need to establish a model of industrial arts curriculum and evaluation suited to the needs of the Department of Industrial and Vocational Education, which at that time was engaged in developing and field testing a rapidly expanding program of teacher education. Later reports by Presling (1972) and Clark (1974) reiterated the need to develop a curriculum review function, but to date no such mechanism has been formally established. LeBlanc (1972) and Ible (1974) found that program graduates perceived that their teacher preparation was inadequate in developing the skills needed to teach industrial arts in the schools, while Haywood (1975) observed that teachers ranked skill in the use of tools, machines and teaching strategies, as highly desirable competencies for industrial arts teachers.

SOME CONTEMPORARY APPROACHES TO CURRICULUM EVALUATION

Curriculum evaluation requires the collection, processing and interpretation of data in order that better decisions can be made about a particular program. Contemporary authorities in the field of education have developed evaluative models which may be applied to a variety of syllabi. Several of these are reviewed in the following section in order to provide background information to be used in the development of the evaluative research design for the study.

According to Cronbach (1963), the process of evaluation may be broadly defined as the collection and use of information in order to make decisions regarding an educational program. Cronbach has identified three useful functions that evaluation performs:

1. course improvement: to determine both strengths and weaknesses, and to indicate areas where change is required,
2. decisions about individuals: to locate the needs of learners in order to plan the instructional process more effectively,
3. administrative regulation: to discover the worth of an educational system and of its instructional staff.

Cronbach suggests that course improvement is the major purpose of evaluation, and expresses the hope that the

evaluative process will provide an insight into educational learning, rather than just reporting on a specific course. According to Cronbach "An ideal evaluation would include measures of all types of proficiency that might reasonably be desired in the program in question, not just the selected outcomes to which the curriculum directs substantial attention" (p.16).

Taylor and Maguire (1966) developed a theoretical model of evaluation which contains five major steps connected linearly, although they recognized that events and processes may not occur in the order that follows.

1. Societal Pressure is seen as the combination of various elements within society which exert pressure that results in the definition of
2. Broad Objectives which are often too imprecise for use by curriculum developers. Such objectives should be redesignated in operational terms, by persons specified as 'curriculum planners' who may be experts from various disciplines or classroom teachers. The purpose of the curriculum planner is to interpret the broad objectives into specific student behaviour descriptions. These behavioural objectives become the
3. Interpretations of the broad objectives.

The evaluator to this point is seen as the gatherer of data which will enable him to identify additions (gains) and/or deletions (losses) that have occurred between the

original statement of a broad objective and its subsequent translation into behavioural terms. Gains accrue from attempts to clarify a vaguely stated aim, i.e. where interpretation results in the formation of a new, extra objective. Losses occur when a broad objective is unable to be behaviourally stated.

The evaluator's data would therefore consist of behavioural objectives which are judged independently for relative worth on the following criteria-

- a. is the objective the proper concern of the educational institution? and
- b. is it of sufficient importance to be included in the program?

A set of operationally stated objectives is then developed which must be translated into a form suitable for instructional use. This phase would be accomplished by persons such as text book writers, teachers, and the like.

The translation phase leads to the development of specific

4. Strategies which may be used in the classroom setting. Here the evaluator's concern would be with determining the extent to which the strategy is shaped by the interpretation and also the effectiveness of the strategy with respect to student outcomes. Data is needed on

- a. the gains due to additions to the objectives,
- b. the losses due to inability to create objectives

and

c. contamination due to false information or unsuitable methodology.

Such data would be used to judge the efficiency and adequacy of the strategies used, and to provide feedback to the instructor in order that improvements may be incorporated.

The final stage is to assess the

5. Outcomes by deciding whether the level of student performance is acceptable or not. Taylor and Maguire point out that feedback data related to student performance should be provided to curriculum planners also, for that is the major source of student generated data from which planning decisions are made.

Evaluative methodology has also been examined by Scriven (1967). He likens formative evaluation to process research, which usually attempts to isolate curriculum variables and to determine their effects. However, such research does not necessarily explain the merit of a particular teaching process. Formative evaluation is intended to locate strengths and weaknesses at an intermediate stage in the development of a teaching instrument. Scriven states that summative or terminal evaluation is able to provide detailed information on the value of a project, which in turn requires value judgments to be made. This in turn raises the question as to whether

such judgments are accurate, because value judgments are subjective, but can be used to determine beliefs held about a particular curriculum. Summative research examines the entire teacher-curriculum package, and is not concerned with identifying specific variables which may be responsible for course deficiency or improvement.

Scriven maintains that evaluation within the terms of goal achievement is poor research as achieving a goal may be of little value if the merit of the goal has not been determined. Summative evaluation need not refer to goals at all, so it may be preferable to goal oriented assessment, which can focus too narrowly on goals that may not reflect the spirit of the curriculum. Comparative evaluation usually seeks to pit one curriculum against another. Frequently the test instrument used is biased in favor of one program, therefore the results obtained may be suspect. However, comparative evaluation is not difficult to complete, and is able to provide information on the worth of a program, while it is still in the developmental stage. Like Cronbach, Scriven prefers non-comparative evaluation, which enables assessment parameters to be established on a broad base in order that the merit of an entire program can be determined.

Scriven indicated two differing approaches to evaluation. One is instructional; that is the evaluation of the teaching instrument itself, with regard to content,

goals, grading processes and teacher attitudes. The other is termed consequential evaluation, or the examination of the effect that the teaching instrument has on the learner. The familiar pre-test post-test situation is an example of the latter. Scriven recommends a form of evaluation which includes the advantages of both the instrumental and consequential methods. Such a type of evaluation would center around goal formation combined with the construction of a bank of test questions based on practical interpretation of the goals. External judgments would be required in order to determine the cohesiveness of the goals, content, and the test questions. The role of the evaluator would therefore be that of a judge. Scriven claims that such a method is capable of providing curriculum developers with an assessment of the degree of success of a given program.

Stufflebeam (1967) believes the purpose of evaluation is to aid in decision making, which may be called for at different points in the curriculum cycle. He developed the CIPP model which enables the following types of evaluation to be undertaken.

1. Context Evaluation which attempts to define the environment where change is to occur, the environment's unmet needs and related problems. By identifying both the major sub-systems and the unmet needs, discrepancies among intended and actual inputs and outputs are located, as are

the causal problems which underly each need.

Context evaluation provides information for deciding on the setting to be served, the goals associated with meeting needs and the objectives associated with problem solving in a curriculum project.

2. Input Evaluation which attempts to determine how to use resources in order to meet the goals and objectives of a particular program. The purpose of input evaluation is to list the capabilities and goal achieving methods available to the agency initiating the project.

Evaluation is conducted by identifying and assessing the system capabilities, plus its goal achievement methods and procedural designs. Input evaluation provides information for deciding whether external assistance is needed in order to achieve the project goals and objectives. Decisions based on this type of evaluation usually result in the project procedures, schedule, staff needs and budgets being specified.

3. Process Evaluation which provides feedback information designed to locate procedural defects during the implementation stage of a project. In this case the evaluator accepts the program at face value, making no attempt to control it. Such evaluation is multivariate and may not focus on all the variables, but only on those that are of importance.

Evaluative data is constantly collected during the life

of the project. and is analyzed as needed. This type of data is often useful in predicting project outcomes.

4. Product_Evaluation which attempts to assess the effectiveness of a project by measuring and interpreting the project outcomes. The method suggested is to operationally define the measured criteria that are associated with the objectives, then compare these measurements with preset standards and finally to rationally analyze the outcomes by reference to the recorded context, input and process data.

Product evaluation is seen as providing information which will enable decisions to be made on whether to continue, terminate, modify or refocus a change activity, also for linking that activity with other phases of the change process.

Operationally, context information would be analyzed infrequently, in order to identify and assign project priorities. Input information would be analyzed locally whenever long or short range programming for problem solving is required. Process information would be analyzed frequently to locate potential failure sources, and whether other process aspects such as project procedures, scheduling, and resources were satisfactory. Product information would be analyzed infrequently to assess the overall effectiveness of the project in meeting its goals and objectives. Such data may be used to reassess how the needs and problems of the system have been modified as a

result of the completed change activity, therefore the CIPP model provides a means of evaluating educational change.

Provus (1972) developed the discrepancy model of evaluation which attempts to apply the systems theory approach to Stufflebeam's concept of program assessment. Provus states that an evaluation cycle has the distinct stages of (a) Content, (b) Installation, (c) Process, and (d) Product. His model is based on locating differences (discrepancies) between an established standard and its actual achievement. Discrepancy testing can be done at any part of a program's development and implementation.

The performance standard concept was drawn from systems analysis theory. However such standards are not permanently established, but may be modified when feedback is received from the system in operation. Provus states that when discrepancy data is located, four decisions are possible: (a) continue to the next stage, (b) recycle the stage after redefining the program standards or processes, (c) recycle to the first stage, or (d) terminate the program.

The Four Stage Cycle is:

Stage one - Definition of the program content.

Stage two - Installation. Observations of the program's performance are taken and compared to the defined program. When discrepancies are found, one of the four decision possibilities are followed. This aspect is similar to the formative evaluation process.

Stage three - Process. Discrepancies between the program and short-term or immediate indicators of the effect of the instructional process are located. Again a decision point is reached.

Stage four is Product evaluation, which compares the program to its terminal objectives. As with the previous stages, a decision point is reached.

In Stake's view (1967) both the purposes and process of evaluation will vary from one instance to another. Stake states that the evaluative process has identifiable characteristics, these being "the evaluation acts, the data sources, the congruence and contingencies, the standards, and the uses of evaluation" (p.525).

Stake believes that an evaluation should reflect both the merits and faults of a program, and that both judgment and descriptive data are essential to the evaluative process. In proposing an evaluative model, Stake has identified three bodies of information from which data should be obtained: antecedents, transactions, and outcomes.

An antecedent is any condition which existed before student instruction occurs, that is, an entry level behaviour. Transactions are the personal interactions that occur during the learning process. For example, class discussion, homework problems, and test administration. Generally an antecedent is static, while a transaction is dynamic. However, these boundaries are not always clearly

defined. Outcomes are the facets of formal evaluation which have traditionally received the most attention, i.e. abilities, achievements, attitudes and aspirations of students which are 'outcomes' of the educational experience. Outcomes are the consequences of educating. Antecedents, transactions and outcomes have a place in both description and judgment matrices.

Intents refer to the goals or objectives of a program. This includes subject matter coverage, the learning environment, planned demonstrations and planned student behavior. The 'Intents' section has places for desired effects, hoped for effects, and anticipated effects. The collection of Intents is a priority listing of all that may happen.

Observations refer to the methods of direct personal observations of situations, as well as interviews, check lists, opinionnaires and psychomotor tests. Stake believes that the evaluator must limit the variables to be studied by ignoring those that, in his opinion, will not enhance the study.

The rationale states the philosophy and purpose of the program to be investigated. It also provides a basis for evaluating Intents and assists in choosing reference groups, who will later pass judgments on the program.

Contingencies and congruence provide two methods of processing descriptive evaluative data. Contingencies are

located among antecedents, transactions and outcomes, while congruence is sought between Intents and Observations. To achieve total congruence, all the intended antecedents, transactions and outcomes would need to occur. Evaluation is seen as a search for relationships that will improve education. The task of the evaluator is to locate outcomes which are dependent on particular antecedent conditions and instructional transactions.

Standards and judgments. Standards of performance are not in common use, as educational programs are not subjected to 'standards oriented' evaluation. A school is unable to evaluate its own program unless it has knowledge of what other schools have done in the same program area. Therefore the quality of an educational program is often difficult to discern, as standards vary from one student to another; from one instructor to another; and from one reference group to another. Informal evaluation tends to leave criteria unspecified, while formal evaluation is usually more specific. While formal evaluation may carefully identify the criteria, it has a tendency to be less concerned with standards of acceptability. Stake submits that it is a responsibility of education to make known the standards that may exist.

Unfortunately, there is no clear picture as to what any curriculum project is achieving, partly because the method of processing judgments is incomplete. Comparing and

Judging can be accomplished from either of two reference bases. One is with respect to an absolute standard, as determined by personal judgments. The other is with respect to relative standards as reflected by differing programs.

Absolute standards would indicate acceptable levels for antecedents, transactions and outcomes. The evaluator would determine whether a set of standards had been achieved. Relative comparison draws its standards from descriptions of other programs. The evaluator has to determine which programs will form a basis for comparison. Therefore both absolute and relative judgments should be made of the program in question, in order to arrive at an educational decision.

SOME CONTEMPORARY VIEWS ON QUESTIONNAIRE DEVELOPMENT

As a questionnaire was to be used to gather data for the study a review of literature related to the use of this type of instrument was conducted. When considering questionnaire design, Oppenheim (1966) maintains that the data collection method to be used is of prime importance. Two common methods are the interview and the mail questionnaire. The interview has the advantage of depth and flexibility, but its use by inexperienced personnel may introduce interviewer bias. Another disadvantage is the large amount of time required to conduct interviews with a

representative sample of a target population. Mail questionnaires are relatively inexpensive to administer, in terms of both time and money, therefore a large sample may be contacted. However, unless the response rate is high (about 80%), bias can be introduced as the sample would not be fully representative of the population. Oppenheim emphasises the need for adequate follow up measures as a means of achieving high response rates.

From the respondent's point of view, a closed question (i.e. one in which a choice of alternative replies is provided), is easier to answer than open questions which require written answers. A comparatively large number of closed questions can be included in a questionnaire. Care must be taken to ensure that a questionnaire has a logical layout, avoids 'loaded' terms, is printed legibly, and has clear instructions.

Behavioral scientists (Cronbach 1960, Helmstader 1964 and Oppenheim 1966) stress the need for test validity and reliability. To be valid, a 'question or item must really measure what it is supposed to measure' (Oppenheim, 1966, p.69). If the content within a questionnaire seems plausible (i.e. related to the subject of investigation), then face validity may be assumed, for as Helmstader noted 'it is difficult to believe that anyone would create test items which did not appear as if they would work' (1964, p.89). Sampling validity relies on the judgment of

experts in the field as a guarantee of content fidelity, while factorial validity uses factor analysis to determine the extent to which content is measured by a given test. Another form of validity refers to group differences where, for example, skilled respondents may be expected to achieve better results than unskilled, on a test which may be biased towards the former. Internal consistency of responses may be determined statistically through the analysis of the item variance-covariance matrix, provided that the number of expected responses is less than the number of respondents, while the follow up study is another means of establishing internal consistency.

Reliability refers to the likelihood of replicating the results of a test. When using interview or self report questionnaires, reliability may be established by re-interviewing some of the respondents. Oppenheim (1966) suggests that a high mail questionnaire response rate is an indicator of test reliability, and that comparison of test results with similar studies may also establish instrument reliability.

In developing an instrument composed of closed questions care must be taken to eliminate researcher bias, which may provide contextual 'clues' and suggest possible 'correct' answers to respondents. Another problem is the halo effect, or tendency to rate a set of items in a consistent fashion. Randomization of response scale

direction may counteract this effect, although Guilford (1954) contends that such randomization may confuse inexperienced respondents to the extent that clerical errors may offset the advantage.

When using mail questionnaires the researcher has no control over respondent bias, which may be a cause of error. According to Helmstader (1964), the most frequent source of error is the tendency of respondents to inflate their ratings to the extent that 'average' may really signify a 'low' rating. Another problem is the error of central tendency, i.e. avoidance of the scale extremes, which can reduce the variability and discrimination of the responses, although Oppenheim (1966) noted that respondents usually prefer a scale with several choices, rather than a simple agree/disagree option.

Having investigated factors relating to basic questionnaire design, research concerned with scaling measures was reviewed, although as Saffir (1937) found, in practice the choice of a scaling technique to be used is usually a matter of practical convenience, rather than of relative validity. Likert type response scales are frequently used in attitude assessment, although the type of scale actually employed may vary considerably. When investigating bipolar scales, Peabody (1962) found that aggregate scores developed from the sum of individual scores on a bipolar six point scale did reflect the direction of

response, and were only minimally affected by the response intensity. He concluded that bipolar items could justifiably be scored on a dichotomous scale, according to the overall direction of the response. Similarly, Komorita (1963) found that the use of a dichotomous scale did not significantly reduce the reliability of data in comparison to that obtained through the use of a multi-step scale. Fisher, et. al. (1968) conducted a study designed to compare the Likert method of scaling attitudes with the method of paired comparisons. The study used two forms of the Minnesota Importance Questionnaire, (one using a five point Likert scale, the other paired comparisons), both of which measured twenty identical dimensions. The samples consisted of 122 students and 175 employed persons. The sample groups completed both forms of each test. Results obtained indicated that,

- a. mean scale scores were more centrally located for the paired comparisons than the Likert test,
- b. variability of scores was greater for the paired comparison than the Likert test,
- c. the Likert scale tended to produce a negatively skewed, peaked distribution, while the paired comparisons tended to produce a flat distribution,
- d. both tests had high reliability, but the Likert was easier for respondents to complete.

The Likert scale problem was further investigated by

Matell and Jacoby (1971), who attempted to determine whether there was an optimal number of alternatives which could be used in the construction of such scales. Their sample consisted of 360 undergraduate university psychology students, split into eighteen groups of twenty. Some eighteen Likert scale formats were developed, which ranged from a dichotomous two point scale to a nineteen point scale. Each scale rated the same set of variables. After analysis of each scale result, Matell and Jacoby concluded that both reliability and validity were not dependent on the number of scale points used in Likert type scales. Furthermore, 'regardless of the number of steps originally employed to collect the data, conversion of these many-stepped response scales to dichotomous or trichotomous measures does not result in any significant decrement in reliability or validity' (p.672). Also the use of a fine rating scale does not increase the refinement of measurement over a two or three point scale, therefore 'investigators would be justified in scoring attitude items dichotomously according to direction of response' (p.673).

SUMMARY

The evaluative models that have been reviewed offer a variety of means to assess the worth of a particular curriculum. The theoretical construct developed by Taylor

and Maguire states that the entire process by which societal values are translated into educationally measurable objectives, teaching strategies and student outcomes should be evaluated. Stufflebeam's CIPP model is designed to assist in decision making at all the various stages of a curriculum project, while Provus has presented a practical approach which enables both formative and summative assessment to occur. Stake too, has designed a strategy capable of locating the merits and faults of an entire program.

The models are comprehensive and permit a detailed investigation of a program to be made by examining aspects of entry level behaviours, the learning process, and the final educational outcomes.

This study was concerned with the evaluation of an on-going program of teacher education which has been in operation for over a decade. The entry level behaviour has been determined by the University of Alberta admission criteria, while the learning process (industrial arts preparatory courses) has evolved over the last ten years. Because both entry level behaviour and the learning process are well established, the focus of the study will be to examine the outcomes of the University of Alberta Industrial arts teacher education program. Therefore a major task of the study will be to identify the curriculum outcomes in detail, i.e. specify the specialized competencies needed to

teach industrial arts in Alberta schools, and then to determine the extent to which those outcomes were perceived to have been achieved via the University of Alberta industrial arts teacher education program.

The CIPP model makes provision for product or outcome assessment while Provus' discrepancy method enables differences between standards (or outcomes) and their achievement to be identified. These concepts have been used as a basis for the research questionnaire developed for the study, although many other factors needed to be considered when designing the questionnaire. The personal interview method can provide in-depth information, but is expensive in terms of time, while mail questionnaires may be administered to a large target population. However, self report data relies on a high rate of return to be of value. Closed questions are not difficult for respondents to complete, and permit a large number of questions to be asked.

Reliability and validity must be considered when developing a questionnaire, although research indicates that instrument reliability is not affected by the type of response scale used. Finally, evidence has been found to suggest that a dichotomous scale does not reduce the reliability of data, even when the respondent data was originally scored on a more extended bipolar scale.

CHAPTER 3

NATURE OF THE STUDY

The study was undertaken in order to identify some of the specialized competencies needed by industrial arts teachers in Alberta, and to determine the extent to which practising industrial arts teachers perceived the effectiveness of their teacher preparation program in developing those competencies. A questionnaire survey of all the teachers who taught industrial arts in Alberta secondary schools during the 1975/76 school year was conducted. The body of the questionnaire was based on seventeen industrial arts content areas developed from the Industrial Arts Curriculum Guides published by the Alberta Department of Education, and was scrutinized by a panel of experts representative of the Department of Education, the University of Alberta, and practising Industrial Arts Teachers.

The data collected led to several conclusions which were generalized to the target population, and provided a considerable amount of information which may be of value to decision makers concerned with the preparation of industrial arts teachers for Alberta secondary schools.

NEED FOR THE STUDY

Since 1963, the preparation of industrial arts teachers for Alberta schools has been a major function of the Department of Industrial and Vocational Education at the University of Alberta. Several aspects of that program have been investigated and the results indicate the desirability of identifying the specialised skills required to teach industrial arts in Alberta schools, and also to ascertain whether the program of teacher preparation does, in fact, adequately develop those skills in its graduates.

To be effective, the industrial arts teacher education program should prepare teachers capable of instructing the industrial arts content areas in Alberta schools. According to Gagne (1967), "What one really wants to know about a given program curriculum is whether it works" (p.29), therefore the need exists to determine whether graduates of the University of Alberta Industrial Arts Teacher Education Program perceive that their preparation has been adequate in developing the abilities required to teach industrial arts in Alberta schools. The study will be of use to the Department of Industrial and Vocational Education, as it will identify the specialized competencies needed in order to teach industrial arts in Alberta schools, and determine the perceived extent to which those competencies are developed in graduates of the University of Alberta

industrial arts teacher education program.

Also, the study may indicate areas within the program where change may be desirable, and provide possible directions for future curriculum planning needs.

USAGE OF TERMS

For the purpose of this study the following terms will be used in the ways indicated:

INDUSTRIAL ARTS; a general education subject within the Alberta secondary school curriculum which has the following purposes;

1. to provide exploratory experiences in various technologies prevalent in a productive society.
2. to provide a synthesizing environment for students to apply their academic knowledge in the solution of practical problems.
3. to provide a supplementary guidance function by introducing the students to the multiplicity and interrelationship of educational and occupational opportunities.
4. to provide an environment which stimulates the individuals to discover and develop their interests and talents.
5. to develop attitudes of safety with a respect for safe working habits and practices in the use of tools, equipment and materials.
6. to develop attitudes of personal and social responsibility.
7. to have students develop an organized conceptual frame of reference interrelating the knowledge of various technologies prevalent in a productive society. (Curriculum Guide, 1969, p.3).

INDUSTRIAL ARTS TEACHER; a person identified by the Alberta Department of Education as a teacher of industrial arts in an Alberta secondary school during the 1975/76 school year.

CONTENT AREA; the principles, concepts, processes and experiences which comprise the learning material for one of the sub-sets of Alberta industrial arts education (power sources, mechanical transmission, fluid transmission, woods, metals, plastics, earths, electricity, electronics, drafting, photography, printing, leather-craft, hot metals, art metal-craft and lapidary-craft), as specified by the Department of Education Curriculum Branch.

PREPARATION COURSE; a sequence of industrial arts teacher education content completed at the University of Alberta. Normally six such preparation courses comprise the unique industrial arts portion of the University of Alberta industrial arts teacher education program.

COMPETENCY; one of several specific industrial arts skills usually acquired as an outcome of completing a University of Alberta preparation course.

PURPOSE OF THE STUDY

The purpose of the study was to determine the extent to

which Alberta industrial arts teachers perceived the value of their program of teacher education in developing the specialized competencies needed to teach industrial arts in Alberta secondary schools. Such information could be used to modify industrial arts teacher education programs that have prepared industrial arts teachers for Alberta schools. To achieve this aim, it was necessary to determine the extent to which Alberta industrial arts teachers perceived the value of their program of teacher education which they completed, in developing the specialized competencies required to teach the Department of Education Program of Studies for Industrial Arts in Alberta schools.

Specifically, the study sought to determine the extent to which:

1. Teachers who received their industrial arts teacher education at the University of Alberta;
 - (a). perceived their program as being of value as preparation for teaching industrial arts to both junior high and senior high school students,
 - (b). perceived their program as being of value as preparation in developing the competencies required in order to teach the industrial arts content areas listed in the Department of Education Program of Studies for Industrial arts,
 - (c). and who completed six or more industrial arts preparation courses perceived their program as being of

value relative to those teachers who completed fewer preparation courses.

2. Teachers who received their industrial arts teacher education at institutions other than the University of Alberta;

(a). perceived their program as being of value as preparation for teaching industrial arts to both junior high and senior high school students,

(b). perceived their program as being of value as preparation in developing the competencies required in order to teach the industrial arts content areas listed in the Department of Education Program of Studies for Industrial Arts.

SCOPE AND LIMITATIONS OF THE STUDY

The scope of the study included that assessment of opinions held by Alberta industrial arts teachers towards the adequacy of their teacher education program(s), the identification of the composition of those teachers on the basis of their preparatory program, and the formation of a list of competencies required in order to teach industrial arts in Alberta secondary schools.

The study was limited by the following factors:

1. Graduates of the University of Alberta Industrial Arts Teacher Education Program who did not teach industrial

arts in Alberta during 1975-76 were excluded.

2. Only the specialized industrial arts competencies were investigated by this study.
3. The assumption that the survey returns accurately represented the opinions of the respondents.
4. The assumption that the respondents' perceptions were unaffected by their teaching experience.
5. The assumption that the questionnaire was adequately prepared to elicit the desired opinions from the respondents.
6. The assumption that teachers shared a similar understanding and interpretation of the competency statements.

RESEARCH DESIGN

The review of contemporary thought on curriculum evaluation indicated that the evaluative process may be concerned with the entry level, process, and outcome phases of a curriculum project. These three aspects have been considered in the following ways.

Entry Level: The requirements to enter a program need to be clearly stated in order that evaluation can determine whether such requirements have been met. At the University of Alberta, matriculation or its equivalent was needed for entry to the Faculty of Education. As all teachers who

completed any portion of the Industrial Arts teacher education program were admitted by the University, it was assumed that the entry level needs were met. Consequently no attempt was made to assess this phase of the curriculum.

Processes: The learning processes need to be defined so that the evaluator can determine the extent to which this aspect of the curriculum has been completed. In this study the processes were the industrial arts preparation courses conducted by the University. As the Department of Industrial and Vocational Education developed the courses, it was assumed that the University had established standards for the courses. Therefore, the completion of such courses would meet the process requirement. Self report data were obtained to assess the extent to which teachers had completed this phase of the curriculum.

Outcomes: A detailed description of expected outcomes of the University of Alberta industrial arts preparation program was not available, however it was assumed that the preparation of teachers capable of teaching industrial arts in Alberta secondary schools was (and is) a major purpose of the Department of Industrial and Vocational Education. Therefore, the researcher designated the outcomes as being the specialized competencies needed in order to teach the Industrial Arts Curriculum which was developed by the Department of Education Curriculum Branch, with the co-operation of the Department of Industrial and Vocational

Education at the University of Alberta and in-service industrial arts teachers. A statement of outcomes was then developed from the Department of Education Program of Studies for High School Industrial Arts (1972), the Curriculum Guide for Industrial Arts General 10-20-30 (1968), and the Junior High School Curriculum Guide for Industrial Arts (1968). According to these publications, industrial arts content could be taught in Alberta junior or senior high schools under the sixteen categories of Power Sources, Mechanical Transmission, Metals, Earths, Electronics, Photography, Leather Craft, Art-metal Craft, Fluid Transmission, Woods, Plastics, Electricity, Drafting, Printing, Hot Metals, and Lapidary Craft, so the content was extracted from the guides and listed under each category. No attempt was made to distinguish junior high school items from senior high school items, it being rationalized that a school student who had completed all possible secondary school industrial arts offerings should have experienced the items listed.

The listings were perused by five staff members of the Department of Industrial and Vocational Education and three industrial arts teachers, in order to establish that the content of industrial arts was fairly represented. The items in each category were then regrouped under eleven headings (e.g. materials items were grouped under material sources, material testing, hand tool use, machine tool use,

material fabrication, safety, tool testing, tool maintenance, material fastening, material finishing, and career information). These outcomes were expressed as competencies and validated by a panel of experts comprising seven representatives of the Department of Industrial and Vocational Education at the University of Alberta, the Associate Director of Curriculum for Industrial Education with the Department of Education and thirteen practising Alberta industrial arts teachers. Self report data were obtained to assess the respondents' perception of the adequacy of their teacher education programs as preparation for teaching Industrial Arts in Alberta.

HYPOTHESES TO BE TESTED

The following hypotheses were developed for the study:

1. The majority of University of Alberta educated industrial arts teachers will perceive as adequate their overall preparation to teach industrial arts to both junior high and senior high school students.
2. The majority of University of Alberta educated industrial arts teachers will perceive as adequate their preparation in developing the specialized competencies required to teach half or more of the seventeen industrial arts content areas.
3. The majority of University of Alberta educated industrial

arts teachers who completed six or more industrial arts preparation courses will value their preparation more than the majority of teachers who completed between four to five and one half preparation courses. This group in turn will value their preparation more than the majority of teachers who completed between two to three and one half preparation courses. Similarly this group will value their preparation more than the majority of teachers who completed between one half to one and one half preparation courses.

4. The majority of non-University of Alberta educated industrial arts teachers will perceive as adequate their overall preparation to teach industrial arts to both junior high and senior high school students.
5. The majority of non-University of Alberta educated industrial arts teachers will perceive as adequate their preparation in developing the specialized competencies required to teach half or more of the seventeen industrial arts content areas.

POPULATION

The population consists of present and future teachers of Industrial Arts in Alberta secondary schools, who were, or will be prepared by the Department of Industrial and Vocational Education at the University of Alberta.

SAMPLE

The sample consisted of the teachers prepared through the University of Alberta Industrial Arts Teacher Education Program, who were teaching in Alberta secondary schools during the 1975/76 school year.

DEVELOPMENT OF THE RESEARCH INSTRUMENT

The survey instrument was a questionnaire. Because mail questionnaires may reach a large sample, this type of instrument was selected for use in the study. The decision to use closed questions was made in order to simplify the answering procedure, and although the researcher was aware of possible halo effects, no attempt was made to randomize the direction of the response scale, because the possibility of clerical error appeared to outweigh the likelihood of careless responses. In order to maximize instrument validity the content was selected from the Alberta Department of Education curriculum for industrial arts, and validated by a panel of expert judges. The internal consistency of responses could be determined through analysis of the item variance-covariance matrix, but it was decided not to develop this statistic because the target population was clearly defined as all in-service industrial arts teachers in Alberta, which should reduce the

probability of error due to group differences. Instrument reliability should be high because the sample was as large as practicable, and both Helmstader (1964) and Ferguson (1966) agree that the combination of large sample size and heterogeneous grouping leads to a more reliable instrument.

Another factor to be decided was the format of the response scale. The literature review indicated that little noticeable difference in results occurred when either a multi-step scale or a dichotomous scale was employed. Further research by Peabody (1962) found that bipolar scaled items may be justifiably scored dichotomously, dependent on the direction of the response, while Helmstader (1964) has stated that Likert type scales enable 'subjects to place themselves on an attitude continuum for each statement' (p.133). Therefore, it was decided to use a six point bipolar scale (no value, most inadequate, inadequate, adequate, most adequate, excellent) for each content question, in order to force responses which reflected the direction of inadequacy or adequacy. However, as the study was concerned with perceptions of adequacy, it was further decided to collapse the data received into a dichotomous 'inadequate/adequate' scale, because as Matell and Jacoby (1971) found, the conversion of multi-stepped scales to dichotomous measures does not significantly reduce either reliability or validity.

The questionnaire was designed to elicit both process

and outcome data from respondents. The processes comprised the industrial arts education preparation courses offered to undergraduate students by the Department of Industrial and Vocational Education. Observations were obtained by respondents indicating on a checklist which of the industrial arts preparation courses had been completed at the University of Alberta. This portion of the instrument only applied to teachers who had completed part (or all) of the University of Alberta Industrial Arts teacher education program.

The outcomes comprised the specialized competencies needed to teach the Industrial Arts Curriculum in Alberta schools. As no list of industrial arts teacher competencies was available, a set was developed by the researcher in the following manner.

Reference to the Department of Education Program of Studies for High School Industrial Arts (1972), the Curriculum Guide for Industrial Arts General 10-20-30 (1968), and the Junior High School Curriculum Guide for Industrial Arts (1968), led to the identification of sixteen industrial arts content areas; Power Sources, Mechanical Transmission, Fluid Transmission, Woods, Metals, Plastics, Earths, Electricity, Electronics, Drafting, Photography, Printing, Leather-craft, Hot Metals, Art Metal-craft, and Lapidary-craft.

Department of Education curriculum guide materials were

further examined to isolate the specific abilities that a school student may reasonably be expected to acquire after completion of a course of study in each of the sixteen industrial arts content areas. Eleven skills for each area were identified,, i.e. 176 in all.

It seems logical that a successful industrial arts teacher should possess (at least) the same skills, therefore each skill was redefined in the format of an industrial arts teacher competency. As well, a further common competency was developed which dealt with the ability to organize and plan to teach each of the sixteen industrial arts content areas. Consequently, 192 competencies were identified in this manner (sixteen areas by twelve competencies each).

A further set of fourteen competencies was developed, which related to general teaching skills such as motivating students, safety procedures, organizational strategies and budgetary skills.

By these means a total of 206 competencies were specified (192 specialized plus 14 general), which in the researcher's opinion were typical of those required of an industrial arts teacher in Alberta. The 206 competencies were representative of the sixteen industrial arts areas plus general teaching abilities, i.e. a total of seventeen industrial arts content areas.

Submission to the panel of experts representative of the Department of Education, the University of Alberta and

practising Industrial Arts Teachers led to some competency statements being respecified to improve clarity and to remove possible ambiguity.

For convenience and to reduce the time commitment of each respondent, two forms of the survey instrument were developed, Form A and B (Appendix 2). Form A contained half of the 196 specialized competencies plus the fourteen general teaching competencies, while Form B included the remaining specialized competencies plus the general teaching competencies. Each form therefore comprised 110 competency statements. Both A and B forms utilized an identical introductory section which elicited the professional history of the respondents.

The survey instrument was presumed to be reliable as the sample comprised all available industrial arts teachers in Alberta. Content validity was accounted for as the instrument was developed from the content of Alberta Industrial Arts, as described in Department of Education Curriculum Guides for Industrial Arts, while face validity was established through the instrument being evaluated by a panel of experts.

DATA COLLECTION PROCEDURE

The Alberta Department of Education listing of industrial arts teachers for 1975/76 was used to identify

two sets of randomly assigned respondents, A and B. Teachers in the A group were sent the Form A questionnaire, while the B group received Form B. Each questionnaire was enclosed with a covering letter, endorsement letter and a prepaid return envelope (Appendix 3).

Unfortunately, the postal service was disrupted ten days later, causing the return of responses to be suspended. When normal mail service resumed six weeks later, a follow up letter plus another questionnaire were sent to those teachers who had not replied. By these means responses were obtained from 331 teachers, or 80% of the defined population.

DATA PROCESSING PROCEDURE

As the responses were received, the relevant information was transcribed to computer coding sheets for subsequent processing into punched data cards. As discussed earlier, the study sought dichotomous (inadequate/adequate) data based on the respondents' perception of program worth as rated on a six point bipolar scale. Therefore, all the responses under the 1, 2, and 3 categories of response (no value, most inadequate, inadequate), were combined and tabulated as being 'inadequate'. Similarly, responses in the 4, 5, and 6 categories (adequate, most adequate, excellent), were tabulated as being 'adequate'.

Responses were categorized according to teacher preparation institution, and in the case of teachers prepared at the University of Alberta, the number of industrial arts preparation courses completed. The data were punched onto computer cards, which were processed by the University's Armdahl 470 computer.

The Division of Educational Research Services nonparametric statistical program (NONP10) was used to tabulate the data. After processing, the data for each variable showed three values:

1. The number of respondents who perceived that variable as being inadequately covered by their program of teacher preparation.
2. The number of respondents who perceived that variable as being adequately covered by their program of teacher preparation.
3. The total number of respondents for that variable.

The next step was to calculate the percentage of respondents who perceived their program of preparation as being adequate in developing that particular variable.

By these means it was possible to match each competency with a numerical figure equivalent to the percentage of respondents who perceived their preparation as adequate, for that variable.

DATA DISPLAY PROCEDURE

After collection and processing, the data were displayed via a series of tables. Tables 7 to 23 (Appendix 1) comprise data relevant to University of Alberta prepared industrial arts teachers only.

Each table in this category refers to one of the seventeen industrial arts content areas identified previously. The left hand side of a table lists the specific competencies relevant to that content area, while the right hand side provides four columns which relate to the amount of University of Alberta industrial arts preparation courses completed.

The appropriate columns contain the numerical figure equivalent to the percentage of respondents who perceived their preparation as adequate, for each specific competency. A fifth column was then developed, which contains the weighted mean of the four preceding values.

The competencies were ranked according to the weighted means then individual column means were calculated. In this manner, a single numerical value representing the perceived adequacy of the University of Alberta program was obtained for each of the seventeen content areas.

Table 5 (p.87) was then compiled and is a representative summary of the perceptions of all University of Alberta educated teachers of the adequacy of the

University of Alberta industrial arts teacher education program.

Tables 24 to 40 (Appendix 1) refer to the perceived adequacy of all programs which have prepared Alberta industrial arts teachers. The tables were compiled in a similar manner to tables 7 to 23, previously mentioned.

Similarly, Table 6 (p.94) is a comprehensive summary of the perception of all Alberta industrial arts teachers of the adequacy of their various programs of teacher preparation.

SUMMARY

The study sought to determine the extent to which Alberta industrial arts teachers perceived the value of their various programs of teacher education in developing the specialized competencies needed to teach industrial arts in Alberta secondary schools.

As the literature indicated that evaluation should include the elements of entry level, process and outcome portions of a curriculum project, these three factors were considered when the research design was developed. Entry level needs for teacher education were assumed to have been set by each institution, and were not assessed.

The research instrument took the form of a questionnaire which elicited process information by asking

respondents to indicate on a checklist, which of the industrial arts preparation courses had been completed at the University of Alberta. A list of specialized industrial arts teacher competencies was developed, and formed the statement of outcomes. Each outcome was assessed on a six point Likert type scale, which was later reduced to a dichotomous 'adequate' or 'inadequate' rating.

Questionnaires were mailed to all 414 practising industrial arts teachers in Alberta and responses received from 331 teachers. Respondent information was punched onto data cards for subsequent computer tabulation. The results obtained were compiled into a series of tables.

CHAPTER 4

FINDINGS OF THE STUDY

This chapter deals with the findings of the study and the testing of the hypotheses. Data were sought from all industrial arts teachers in the Province, questionnaires being sent to 414 teachers, of whom 331 (80%) replied.

The composition of the industrial arts teaching force, on the basis of location of teacher preparation is illustrated by Table 1. Most teachers (64%) were prepared in Alberta, nearly one half (46%) having attended the University of Alberta program, while 18% were graduates of the superseded Calgary program.

Of the remainder, 11% were prepared by various institutions in the United States of America, while 4% had attended various other Canadian institutions. It should be noted that 10% had received no formal industrial arts preparation at all, although half of these teachers hold vocational qualifications which permit them to teach industrial arts in Alberta schools. Nine percent of the responses were invalid.

Table 1
Questionnaire Return Summary

Teacher Education Institution	n	% of Population	% of Returns
University of Alberta	150	36	46
University of Alberta at Calgary	60	15	18
Other Canadian Institutions	14	3	4
U.S.A. Institutions	37	9	11
Other Institutions	8	2	2
Vocational Programs	16	4	5
Non-Industrial Arts Programs	17	4	5
Invalid Returns	29	7	9
Questionnaires Returned	331	80%	100%
Questionnaires Distributed	414	100%	

Before completing the main portion of the questionnaire, which related to the individual industrial arts competencies, teachers assessed the adequacy of their program as preparation to teach industrial arts to Alberta secondary school students (Table 2).

Seventy eight percent of the University of Alberta at Calgary prepared teachers rated as adequate their preparation to teach industrial arts to junior high school students, as compared to 69% of the University of Alberta prepared teachers. Between 64% and 100% of the non-Alberta prepared teachers perceived as adequate their preparation to teach industrial arts to junior high school students. However, it should be noted that these non-Alberta figures refer to small samples and a wide variety of unspecified teacher education programs.

With regard to senior high school industrial arts preparation, 68% of the University of Alberta at Calgary prepared teachers felt adequately prepared to teach industrial arts to senior high school students, as compared to 36% of the University of Alberta prepared teachers. Between 50% and 95% of non-Alberta prepared teachers felt adequately prepared to teach industrial arts to senior high school students.

Table 2

Percentage of Alberta Industrial Arts Teachers Who Perceive
 Their Preparation as Adequate to Teach Industrial Arts to
 Alberta Secondary School Students

Institution	n	Junior High %	Senior High %
University of Alberta	150	69	36
University of Alberta at Calgary	60	78	68
Other Canadian Institutions	14	64	50
U.S.A. Institutions	37	97	95
Other Institutions	8	100	86

The relationship between University of Alberta graduates' industrial arts preparation courses completed and perception of program adequacy to teach secondary school industrial arts students is illustrated by Table 3.

Of the 150 teachers, 92 had completed six or more preparation courses, and 72% of these rated as adequate, their preparation to teach junior high school industrial arts students. Between 58% and 71% of the teachers who completed less than six preparation courses, perceived their preparation as adequate. It may be noted that a greater proportion (71%) of the teachers who completed two to three and one half preparation courses felt adequately prepared to teach industrial arts to junior high school students, as compared to 58% of those who completed four to five and one half preparation courses.

At the senior high school level, only 27% of the teachers who completed six or more preparation courses perceived their preparation as adequate to teach industrial arts to senior high school students, while between 46% and 54% of the teachers with less preparation courses perceived their preparation as adequate. It may be noted that the teachers who feel best prepared to teach industrial arts to senior high school students are the group of 24 who have completed between two and three and one half preparation courses.

Table 3

Percentage of University of Alberta Prepared Industrial Arts Teachers Who Perceive Their Preparation as Adequate to Teach Industrial Arts to Alberta Secondary School Students

Industrial Arts Courses Completed	n	Junior High %	Senior High %
0.5 to 1.5	10	60	50
2.0 to 3.5	24	71	54
4.0 to 5.5	24	58	46
6.0 or more	92	72	27
Total	150	69%	36%

An examination of those teachers' responses revealed that ten hold more than one university qualification (i.e. a non-education degree plus a graduate diploma in education), while five possess vocational experience in addition to their two to three and one half industrial arts preparation courses.

Table 4 relates the quantity of preparation courses completed by University of Alberta educated teachers, with their industrial arts teaching experience.

The majority (92) of the 150 teachers had completed six or more content courses and 71 of them had taught industrial arts in Alberta for periods ranging up to five years. Of the 24 teachers with two to three and one half preparation courses completed, 16 have taught industrial arts for less than five years. Overall, 106 industrial arts teachers (71%) have less than five years teaching experience.

Tables 6 to 23 (Appendix 1) refer to University of Alberta educated industrial arts teachers only, and display their perception of adequacy of preparation in each of the seventeen industrial arts content areas. Each table relates the quantity of industrial arts preparation courses completed, with perception of program adequacy as applied to each of the individual competencies which comprise an industrial arts content area.

Table 4

University of Alberta Prepared Industrial Arts Teachers
Preparation Courses by Teaching Experience

Industrial Arts Courses Completed	n	0-2	Years 3-5	6-8	9+
.5 to 1.5	10	2	4	2	2
2.0 to 3.5	24	10	6	2	6
4.0 to 5.5	24	7	6	6	5
6.0 or more	92	34	37	15	6
Total	150	53	53	25	19

Weighted means were calculated for the competencies, which were then rank ordered. Column means were also obtained, as was the grand mean which provides a representative numerical value for each content area. Tables 6 to 23 also contain two common competencies, one relative to the ability to locate career oriented information and the other concerned with the ability to plan to teach a specific content area.

The ranked perception of program adequacy for the career oriented competency in each content area was; Printing (38%), Electricity (31%), Earths (31%), Metals (31%), Plastics (30%), Power Sources (30%), Woods (29%), Electronics (26%), Photography (26%), Drafting (24%), Mechanical Transmission (22%), Fluid Transmission (16%), Hot Metals (13%), Art Metal-craft (6%), Leather-craft (3%) and Lapidary-craft (2%). No competency was rated above 50%, although Printing, Electricity, Earths, Metals, Plastics, Power Sources and Woods were ranked equal to or above this competency mean of 29%.

The ranked perception of program adequacy for the organizational and planning competency in each content area was; Photography (53%), Earths (49%), Woods (49%), Plastics (45%), Metals (42%), Printing (39%), Electricity (35%), Electronics (34%), Drafting (25%), Power Sources (24%), Fluid Transmission (21%), Mechanical Transmission (19%), Hot Metals (15%), Art Metal-craft (8%), Leather-craft (3%) and Lapidary-craft (2%). The only competency rated above 50%

was Photography, although Earths, Woods, Plastics, Metals, Printing, Electricity, Electronics, Drafting and Power Sources were ranked above this competency mean of 22%.

Table 5 relates to the 150 University of Alberta educated industrial arts teachers only, and comprises the means of their perception of adequacy of preparation in each of the seventeen industrial arts content areas previously identified. The source of the data for this table is included as Appendix 1.

Data in the table were examined on the basis of both the amount of preparation courses completed (vertical columns), and industrial arts content areas (horizontal rows). The amount of preparation will be discussed in relation to the content areas.

Of the ten teachers who had completed between one half and one and one half preparation courses (Group A, 7% of the sub-sample), preparation in the eight areas of Woods (50%), Plastics (47%), General (46%), Drafting (44%), Photography (35%), Electricity (35%), Earths (29%) and Power Sources (25%) were ranked above the Group A mean for the seventeen areas of 24%. The areas of Printing (22%), Hot Metals (20%), Metals (19%), Fluid Transmission (13%), Electronics (8%), Mechanical Transmission (0%), Leather Craft (0%), Art-metal Craft (0%) and Lapidary Craft (0%) were all rated below the Group A mean. It should be noted that only in one of the seventeen content areas (Woods) was preparation rated

Table 5

University of Alberta Prepared Teachers' Perception of Program Adequacy: Means of Content Area Competencies by Amount of Preparation

	(A)	n	(B)	n	(C)	n	(D)	n	Total	
General	46	10	51	24	42	24	41	92	43	150
Power Sources	25	4	43	12	44	12	51	39	47	67
Mechanical Transmission	0	4	30	12	26	12	36	39	31	67
Metals	19	4	36	12	51	12	39	39	39	67
Earths	29	4	49	12	39	12	45	39	44	67
Electronics	8	4	40	12	47	12	46	39	43	67
Photography	35	4	70	12	59	12	59	39	60	67
Leather Craft	0	4	8	12	0	12	3	39	3	67
Art-metal Craft	0	4	19	12	0	12	8	39	8	67
Fluid Transmission	13	6	41	12	44	12	55	53	48	83
Woods	50	6	47	12	52	12	47	53	48	83
Plastics	47	6	43	12	50	12	45	53	46	83
Electricity	35	6	48	12	44	12	48	53	47	83
Drafting	44	6	31	12	20	12	38	53	35	83
Printing	22	6	45	12	53	12	49	53	47	83
Hot Metals	20	6	31	12	18	12	19	53	20	83
Lapidary Craft	0	6	8	12	0	12	2	53	2	83
Means	24%		37%		34%		36%		36%	

Note : letters in parentheses indicate the number of Industrial Arts Preparation Courses Completed

- (A) = 0.5 to 1.5 course equivalents
- (B) = 2.0 to 3.5 course equivalents
- (C) = 4.0 to 5.5 course equivalents
- (D) = 6.0 or more course equivalents

at 50% or more.

Of the 24 teachers who had completed between two and three and one half preparation courses (Group B, 16% of the sub-sample), preparation in the ten areas of Photography (70%), General (51%), Earths (49%), Electricity (48%), Woods (47%), Printing (45%), Power Sources (43%), Plastics (43%), Fluid Transmission (41%) and Electronics (40%) were ranked above the Group B mean for the seventeen areas of 37%. The areas of Metals (36%), Drafting (31%), Hot Metals (31%), Mechanical Transmission (30%), Art-metal Craft (19%), Leather Craft (8%) and Lapidary Craft (8%) were all ranked below the Group B mean. It should be noted that only in two of the seventeen content areas (Photography, General) was preparation ranked at 50% or more.

Of the 24 teachers who had completed between four and five and one half preparation courses (Group C, 16% of the sub-sample), preparation in the eleven areas of Photography (59%), Printing (53%), Woods (52%), Metals (51%), Plastics (50%), Electronics (47%), Power Sources (44%), Fluid Transmission (44%), Electricity (44%), General (42%) and Earths (39%) were ranked above the Group C mean for the seventeen areas of 34%. The areas of Mechanical Transmission (26%), Drafting (20%), Hot Metals (18%), Leather Craft (0%), Art-metal Craft (0%) and Lapidary Craft (0%) were all ranked below the Group C mean. It should be noted that only in five of the seventeen content areas

(Photography, Printing, Woods, Metals, Plastics) was preparation ranked at 50% or more.

Of the 92 teachers who had completed six or more preparation courses (Group D, 61% of the sub-sample), preparation in the thirteen areas of Photography (59%), Fluid Transmission (55%), Power Sources (51%), Printing (49%), Electricity (48%), Woods (47%), Electronics (46%), Earths (45%), Plastics (45%), General (41%), Metals (39%), Drafting (38%) and Mechanical Transmission (36%) were ranked equal to or above the Group D mean for the seventeen areas of 36%. The areas of Hot Metals (19%), Art-metal Craft (8%), Leather Craft (3%) and Lapidary Craft (2%) were all ranked below the Group D mean. It should be noted that only in three of the seventeen content areas (Photography, Fluid Transmission, Power Sources) was preparation ranked at 50% or more.

When the results of Groups A, B, C and D were amalgamated ('Total' column), then preparation in the eleven content areas of Photography (60%), Fluid Transmission (48%), Woods (48%), Electricity (47%), Power Sources (47%), Printing (47%), Plastics (46%), Earths (44%), General (43%), Electronics (43%) and Metals (39%) were ranked above the mean for the seventeen areas for the entire University of Alberta sample ($n=150$) of 36%. The content areas of Drafting (35%), Mechanical Transmission (31%), Hot Metals (20%), Art-metal Craft (8%), Leather Craft (3%) and Lapidary

Craft (2%) were ranked below the Grand Mean of 36%. It should be noted that only in one of the seventeen content areas (Photography) was preparation rated at 50% or more.

With the exception of the Group A mean of 24%, the means for Groups B to D and the Grand Mean, ranged from 34% to 37%. As the ten Group A respondents had completed less than two industrial arts preparation courses, it seems reasonable to expect that their perception of preparation adequacy would be less than those teachers who had completed more preparation courses (Groups B to D). Because the University of Alberta industrial arts teacher education program was originally structured to develop junior high school level industrial arts competence after the completion of at least two and one half preparation courses, it also seems reasonable to expect Group B teachers to perceive themselves as being more adequately prepared than Group A teachers.

Examination of the means of Groups B to D, plus the Grand Mean reveals comparatively little range (34% to 37%). Further examination of the combined Group Totals indicates that the 150 teachers as a whole, rank eleven of the content areas above the Grand Mean; Group D (92 teachers) rank thirteen content areas above the Group D mean; Group C (24 teachers) rank eleven content areas above the Group C mean; Group B (24 teachers) rank ten content areas above the Group B mean; as compared to Group A (10 teachers) who ranked

eight content areas above the Group A mean.

If Group A is ignored, it is found that the ten common content areas of Photography, Fluid Transmission, Woods, Electricity, Power Sources, Printing, Plastics, Earths, General and Electronics are consistently ranked above both the Grand Mean and the individual means of Groups B to D. Preparation in the areas of Metals, Drafting, Mechanical Transmission, Hot Metals, Art-metal Craft, Leather Craft and Lapidary craft was ranked below the Grand Mean.

The content areas will be discussed in relation to amount of industrial arts preparation courses completed.

For Group A, the teachers who completed between one half to one and one half preparation courses, the five content areas of Woods (50%), Plastics (47%), General (46%), Drafting (44%) and Hot Metals (20%) were rated equal to or above the combined (Total) mean of each area.

For Group B, the 24 teachers who had completed between two to three and one half preparation courses, the eight content areas of Photography (70%), General (51%), Earths (49%), Electricity (48%), Hot Metals (31%), Art Metal-craft (19%), Leather Craft (8%) and Lapidary Craft (8%) were rated equal to or above the combined (Total) mean of each content area.

For Group C, the 24 teachers who had completed between four to five and one half preparation courses, the five content areas of Printing (53%), Woods (52%), Metals (51%),

Plastics (50%) and Electronics (47%) were rated equal to or above the combined (Total) mean of each content area.

For Group D, the 92 teachers who had completed six or more preparation courses, the ten content areas of Fluid Transmission (55%), Power Sources (51%), Printing (49%), Electricity (48%), Electronics (46%), Earths (45%), Metals (39%), Drafting (38%), Mechanical Transmission (36%) and Art-metal Craft (8%) were rated equal to or above the combined (Total) mean of each content area.

To summarize, Group D (six or more courses) rated eleven of the seventeen areas as equal to or above the combined (Total) means, while Group B (two to three and one half courses) rated eight of the areas equal to or above the combined (Total) means, as compared to Groups A (one half to one and one half courses) and C (four to five and one half courses), both of whom rated five of the areas equal to or above the combined (Total) means. The observation that eight content areas were rated above the Group B mean, which is more than the five content areas rated above the Group C mean, is of interest. The latter group refers to teachers who had more preparation courses than did Group B. However, this observation is consistent with the findings of Table 3 (p.82), which indicates that although Group B teachers had less industrial arts preparation than Group C teachers, the Group B sub-sample included a large proportion (63%) of the 24 teachers who had some post secondary education prior to

entry to the University of Alberta industrial arts program.

In the case of Group D, seven of the ten content areas (Fluid Transmission, Power Sources, Printing, Electricity, Electronics, Drafting, Mechanical Transmission), which were ranked above the Group D mean were technology oriented. This could suggest that the completion of the entire four year University of Alberta industrial arts teacher education program appears to develop a discernable orientation towards the technology based content areas.

Table 6 refers to all Alberta industrial arts teachers, on the basis of teacher education program, and comprises the means of their perception of adequacy of preparation in each of the seventeen industrial arts content areas. The source of the data is included in Appendix 1.

Data in the table were examined on the basis of preparation program (vertical columns) and industrial arts content areas (horizontal rows). The preparation programs will be discussed in relation to the content areas.

The ranked perceptions of program adequacy for the seventeen Group A (University of Alberta) content areas were; Photography (60%), Fluid Transmission (48%), Woods (48%), Electricity (47%), Power Sources (47%), Printing (47%), Plastics (46%), Earths (44%), General (43%), Electronics (43%), Metals (39%), Drafting (35%), Mechanical Transmission (31%), Hot Metals (20%), Art Metal-craft (8%), Leather-craft (3%) and Lapidary-craft (2%). The only

	(A)	n	(B)	n	(C)	n	(D)	n	(E)	n	Total	n
General	43	150	55	60	49	14	86	37	89	8	53	269
Power Sources	47	67	49	31	62	6	78	20	0	1	53	125
Mechanical Transmission	31	67	38	31	57	6	46	20	0	1	36	125
Metals	39	67	72	31	72	6	82	20	100	1	56	125
Earths	44	67	20	31	0	6	17	20	67	1	32	125
Electronics	43	67	20	31	18	6	43	20	0	1	36	125
Photography	60	67	18	31	29	6	32	20	0	1	43	125
Leather Craft	3	67	17	31	13	6	77	20	0	1	19	125
Art-metal Craft	8	67	34	31	9	6	58	20	100	1	23	125
Fluid Transmission	48	83	12	29	55	8	18	17	23	7	36	144
Woods	48	83	86	29	46	8	91	17	86	7	62	144
Plastics	46	83	15	29	25	8	84	17	29	7	42	144
Electricity	47	83	72	29	61	8	73	17	77	7	57	144
Drafting	35	83	84	29	74	8	88	17	93	7	56	144
Printing	47	83	7	29	29	8	65	17	66	7	41	144
Hot Metals	20	83	46	29	59	8	67	17	79	7	36	144
Lapidary Craft	2	83	9	29	14	8	46	17	0	7	9	144
Means	36%		37%		37%		59%		50%		41%	

Note: letters in parentheses indicate preparation institution(s).

(A) = University of Alberta

(B) = University of Alberta at Calgary

(C) = Other Canadian Institutions

(D) = U.S.A. Institutions

(E) = Other Institutions

content area rated above 50% was Photography, although the ten additional content areas of Fluid Transmission, Woods, Electricity, Power Sources, Printing, Plastics, Earths, General, Electronics and Metals were ranked above the University of Alberta mean value of 36%.

The ranked perception of program adequacy for the seventeen Group B (University of Alberta at Calgary) content areas was; Woods (86%), Drafting (84%), Metals (72%), Electricity (72%), General (55%), Power Sources (49%), Hot Metals (46%), Mechanical Transmission (38%), Art Metal-craft (34%), Earths (20%), Electronics (20%), Photography (18%), Leather-craft (17%), Plastics (15%), Fluid Transmission (12%), Lapidary-craft (9%) and Printing (7%). The five content areas rated above 50% were Woods, Drafting, Metals, Electricity and General, while the three additional content areas of Power Sources, Hot Metals and Mechanical Transmission were ranked above the University of Alberta at Calgary mean of 37%.

The ranked perception of program adequacy for the seventeen Group C (Other Canadian Institutions) content areas were; Drafting (74%), Metals (72%), Power Sources (62%), Electricity (61%), Hot Metals (59%), Mechanical Transmission (57%), Fluid Transmission (55%), General (49%), Woods (46%), Photography (29%), Printing (29%), Plastics (25%), Electronics (18%), Lapidary-craft (14%), Leather-craft (13%), Art Metal-craft (9%) and Earths (0%). The

seven content areas rated above 50% were Drafting, Metals, Power Sources, Electricity, Hot Metals, Mechanical Transmission and Fluid Transmission. The two additional content areas of General and Woods were ranked above the Other Canadian Institutions mean of 37%.

The ranked perception of program adequacy for the seventeen Group D (U.S.A. Institutions) content areas were; Woods (91%), Drafting (88%), General (86%), Plastics (84%), Metals (82%), Power Sources (78%), Leather-craft (77%), Electricity (73%), Hot Metals (67%), Printing (65%), Art Metal-craft (58%), Mechanical Transmission (46%), Lapidary-craft (46%), Electronics (43%), Photography (32%), Fluid Transmission (18%) and Earths (17%). The eleven content areas rated above 50% were Woods, Drafting, General, Plastics, Metals, Power Sources, Leather-craft, Electricity, Hot Metals, Printing and Art Metal-craft. The Group D mean was 59%.

The ranked perception of program adequacy for the seventeen Group E (Other Institutions) content areas were; Metals (100%), Art Metal-craft (100%), Drafting (93%), General (89%), Woods (86%), Hot Metals (79%), Electricity (77%), Earths (67%), Printing (66%), Plastics (29%), Fluid Transmission (23%), Power Sources (0%), Mechanical Transmission (0%), Electronics (0%), Photography (0%), Leather-craft (0%), Lapidary-craft (0%). The nine content areas rated above 50% were Metals, Art Metal-craft,

Drafting, General, Woods, Hot Metals, Electricity, Earths and Printing. The Group E mean was 50%.

The 'Total' column shows the weighted mean of each content area, and is therefore representative of all industrial arts teachers in Alberta. This column will be discussed as it relates to the various preparation programs.

Group A teachers (University of Alberta) rated preparation in the six content areas of Photography (60%), Fluid Transmission (48%), Printing (47%), Plastics (46%), Earths (44%) and Electronics (43%) as equal to or above the 'Total' mean of each area.

Group B teachers (University of Alberta at Calgary) rated preparation in the nine content areas of Woods (86%), Drafting (84%), Metals (72%), Electricity (72%), General (55%), Hot Metals (46%), Mechanical Transmission (38%), Art-metal Craft (34%) and Lapidary Craft (9%) as equal to or above the 'Total' mean of each area.

Group C teachers (Other Canadian Institutions) rated preparation in the eight content areas of Drafting (74%), Metals (72%), Power Sources (62%), Electricity (61%), Hot Metals (59%), Mechanical Transmission (57%), Fluid Transmission (55%) and Lapidary Craft (14%) as equal to or above the 'Total' mean of each area.

Group D teachers (United States of America) rated preparation in the fourteen content areas of Woods (91%), Drafting (88%), General (86%), Plastics (84%), Metals (82%),

Power Sources (78%), Leather Craft (77%), Electricity (73%), Hot Metals (67%), Printing (65%), Art-metal Craft (58%), Mechanical Transmission (46%), Lapidary Craft (46%) and Electronics (43%) as equal to or above the 'Total' mean of each area.

Group E teachers (Other Institutions) rated preparation in the nine content areas of Metals (100%), Art-metal Craft (100%), Drafting (93%), General (89%), Woods (86%), Hot Metals (79%), Electricity (77%), Earths (67%) and Printing (66%) as equal to or above the 'Total' mean of each area.

The Grand Mean of industrial arts preparation of Alberta teachers is 41%. Group D (U.S.A. Institutions) and E (Other Institutions) means of 59% and 50%, respectively, rate above the Grand Mean, while Group B (University of Alberta at Calgary) and C (Other Canadian Institutions) means (37%) and the Group A (University of Alberta) mean of 36% are below the Grand Mean.

In addition, Table 6 provides an overview of the types of programs which have prepared Alberta industrial arts teachers. An examination of column A (University of Alberta), indicates that the program's emphasis appears to be towards four of the materials content areas (Metals, Earths, Woods, Plastics), and eight technology areas (Power Sources, Mechanical Transmission, Electronics, Photography, Fluid Transmission, Electricity, Drafting, Printing). The major strength of the program appears to be in preparation

for Photography (60%). The content areas of Fluid Transmission (48%), Woods (48%), Power Sources (47%), Electricity (47%) and Drafting (47%) follow, but have perceived values less than 50%, or inadequate.

Reference to column B (University of Alberta at Calgary), discloses that the program's emphasis appears to have been towards four of the materials content areas (Metals, Art-metal Craft, Woods, Hot Metals), and four of the technology areas (Power Sources, Mechanical Transmission, Electricity, Drafting). The major strength of the program appears to have been in preparation for Woods (86%), Drafting (84%), Metals (72%), Electricity (72%) and Power Sources (49%).

It is therefore apparent that the major difference between the two programs is the added emphasis placed by the University of Alberta on technology, as evidenced by the inclusion of the content areas of Electronics, Photography, Fluid Transmission and Printing, none of which formed part of the superseded University of Alberta at Calgary program. The University of Alberta apparently attempted to develop a broad based program which was perceived by its graduates as being generally inadequate as preparation in all but one of the industrial arts content areas. On the other hand, the University of Alberta at Calgary program which was less technology oriented, was perceived by its graduates to provide adequate preparation for five of the industrial arts

content areas.

When referring to the remainder of the table, it must be remembered that columns C, D, and E do not pertain to any identifiable program, but are based on geographical areas. Those 14 teachers prepared in provinces other than Alberta (column C) appear to have experienced programs with composite emphasis towards four of the materials content areas (Metals, Woods, Plastics, Hot Metals), and seven of the technology content areas (Power Sources, Mechanical Transmission, Photography, Fluid Transmission, Electricity, Drafting, Printing). Similarly, teachers prepared by various programs in the United States of America (column C) appear to have experienced programs with a composite emphasis on seven of the materials content areas (Metals, Leather Craft, Art-metal Craft, Woods, Plastics, Hot Metals, Lapidary Craft), and seven of the technology content areas (Power Sources, Mechanical Transmission, Electronics, Photography, Electricity, Drafting, Printing).

Column E refers to eight teachers prepared outside Canada or the United States of America, and was not relevant to this study.

HYPOTHESES TESTING

Five hypotheses were developed for the study. Each was tested in turn against the data collected.

Hypothesis 1 stated that the majority of University of Alberta educated industrial arts teachers will perceive as adequate, their overall preparation to teach industrial arts to both junior high and senior high school students.

Table 2 (p.80) displays the data necessary to test this hypothesis. 69% of the University of Alberta prepared teachers perceived as adequate, their preparation to teach industrial arts to junior high school students, as compared to 36% who perceived as adequate their preparation to teach industrial arts to senior high school students.

As the perceived adequacy of any variable identified within the study could range from 0% to 100%, it was decided to use the mid-value of 50% as a cutting point, so that a rating of 50% or greater (i.e. a simple majority of respondent opinion) was regarded as 'adequate', while a rating of less than 50% was regarded as 'inadequate'. The use of majority opinion as a decision making criterion is well established in Alberta, as public officials are elected on this basis (e.g. members of the Legislative Assembly, local government members, and school boards) and utilize majority opinion to resolve most issues during their decision making meetings. The 50% criterion value was chosen in this case for discussion and hypothesis testing purposes only. It is assumed that decision makers will use a criterion which they feel appropriate for their own

purpose.

Testing the data against this criterion resulted in Hypothesis 1 being accepted at the junior high school level, and rejected at the senior high school level.

Conclusion 1a. The majority of University of Alberta educated teachers perceived as adequate, their preparation to teach industrial arts to junior high school students.

1b. The majority of University of Alberta educated teachers do not perceive as adequate, their preparation to teach industrial arts to senior high school students.

Hypothesis 2 stated that the majority of University of Alberta educated industrial arts teachers will perceive as adequate, their preparation in developing the specialized competencies required to teach more than half of the seventeen industrial arts content areas.

Table 6 (p.94) presents the data necessary to test this hypothesis. The ranked perceptions of program adequacy for the seventeen Group A (University of Alberta) content areas were; Photography (60%), Fluid Transmission (48%), Woods (48%), Electricity (47%), Power Sources (47%), Printing (47%), Plastics (46%), Earths (44%), General (43%), Electronics (43%), Metals (39%), Drafting (35%), Mechanical Transmission (30%), Hot Metals (20%), Art Metal-craft (8%),

Leather-craft (3%) and Lapidary-craft (2%). The only content area rated above 50% was Photography, Although the ten additional content areas of Fluid Transmission, Woods, Electricity, Power Sources, Printing, Plastics, Earths, General, Electronics and Metals were ranked above the University of Alberta mean value of 36%.

Again, a rating of 50% or greater was regarded as 'adequate', while a rating less than 50% was regarded as 'inadequate'. Testing the data against this criterion resulted in Hypothesis 2 being accepted for the content area of photography only, and rejected for the remaining sixteen areas.

Conclusion 2. The majority of University of Alberta educated teachers perceived as adequate, their preparation in developing the competencies needed to teach less than half of the seventeen of the industrial arts content areas.

Hypothesis 3 stated that the majority of University of Alberta educated teachers who completed six or more industrial arts content courses would value their preparation more than the majority of teachers who completed between four to five and one half preparation courses. This group in turn will value their preparation more than the majority of teachers who completed between two to three and one half preparation

courses. Similarly, this group will value their preparation more than the majority of teachers who completed between one half to one and one half preparation courses.

Table 5 (p.87) presents the data to test this hypothesis. A measure of relative value of preparation was obtained from the means of the table, which ranged from 37% to 24%. By inspection, it appeared that the Group A (one half to one and one half courses) mean of (24%) was relatively lower than the Group B (two to three and one half courses), C (four to five and one half courses), and D (six or more courses) means which ranged from 34% to 37%. On this basis, the three groups (B, C, and D), generally appeared to value their total preparation equally, while Group A attached less value to their preparation.

However, the Grand Mean of 36% is a measure of the total perceived value of the University of Alberta program. Therefore, that value was selected as a criterion reference point, so that perceived values equal to or greater than 36% were categorized as being of 'relative value'. Conversely, perceived values less than 36% were categorized as being of 'relatively less value'.

On this basis, Group D (six or more courses) perceived preparation in thirteen content areas as being of value, while Groups C (four to five and one half courses) and B (two to three and one half courses) perceived preparation in

eleven content areas as being of value, as compared to Group A (one half to one and one half courses) which perceived preparation in four content areas as being of value. It may be noted that the seven content areas of Photography, Woods, Plastics, General, Electricity, Earths and Power Sources were rated above the individual means of the four groups (A,B,C,D). This consistency could be an indication of some degree of satisfaction by all the groups with their preparation in those seven content areas.

Testing the data against these criteria resulted in Hypothesis 3 being accepted, because Group D (13 areas, mean 36%); was relatively more than Group C (11 areas, mean 34%) and Group B (11 areas, mean 37%); which in turn was relatively more than Group A (4 areas, mean 24%).

Conclusion 3. University of Alberta educated teachers who completed six or more industrial arts content courses value their preparation more than teachers who completed fewer industrial arts preparation courses.

Hypothesis 4 stated that the majority of non-University of Alberta educated industrial arts teachers will perceive as adequate, their overall preparation to teach industrial arts to both junior high and senior high school students.

Non-University of Alberta educated teachers comprised graduates from the University of Alberta at Calgary, Other

Canadian Institutions, the United States of America and Other Institutions.

Table 2 (p.80) presents the data necessary to test this hypothesis. University of Alberta at Calgary teachers rated their preparation to teach industrial arts to junior high and senior high school students at 78% and 68%, respectively. Other Canadian Institutions rated their preparation at 64% and 50% respectively. U.S.A. Institutions rated their preparation at 97% and 95% respectively. Other Institutions rated their preparation at 100% and 86% respectively. Again, a rating of 50% or greater was regarded as 'adequate', while a rating of less than 50% was regarded as 'inadequate'.

Testing the data against this criterion resulted in Hypothesis 4 being accepted at both the junior high and senior high school levels of instruction.

Conclusion 4. Non-University of Alberta educated teachers perceive as adequate, their preparation to teach industrial art to both junior high and senior high school students.

Hypothesis 5 stated that the majority of non-University of Alberta educated industrial arts teachers will perceive as adequate, their preparation in developing the competencies required to teach half or more of the seventeen of the industrial arts content areas.

Table 6 (p.94) presents the data necessary to test this hypothesis. Perception of program adequacy for each of the seventeen industrial arts content areas for Group B (University of Alberta at Calgary), ranged from 86% to 7% with a mean of 37%. Group C (other Canadian institutions), ranged from 74% to 0% with a mean of 37%. Group D (United States of America), ranged from 88% to 17% with a mean of 59%. Group E (other Institutions) ranged from 100% to 0% with a mean of 50%.

As before, a rating of 50% or greater was regarded as 'adequate', while a rating of less than 50% was regarded as 'inadequate'. The ranked perception of program adequacy for the seventeen Group B (University of Alberta at Calgary) content areas was; Woods (86%), Drafting (84%), Metals (72%), Electricity (72%), General (55%), Power Sources (49%), Hot Metals (46%), Mechanical Transmission (38%), Art Metal-craft (34%), Earths (20%), Electronics (20%), Photography (18%), Leather-craft (17%), Plastics (15%), Fluid Transmission (12%), Lapidary-craft (9%) and Printing (7%). The five content areas rated above 50% were Woods, Drafting, Metals, Electricity and General, while the three additional content areas of Power Sources, Hot Metals and Mechanical Transmission were ranked above the University of Alberta at Calgary mean of 37%.

The ranked perception of program adequacy for the seventeen Group C (Other Canadian Institutions) content

areas were; Drafting (74%), Metals (72%), Power Sources (62%), Electricity (61%), Hot Metals (59%), Mechanical Transmission (57%), Fluid Transmission (55%), General (44%), Woods (46%), Photography (29%), Printing (29%), Plastics (25%), Electronics (18%), Lapidary-craft (14%), Leather-craft (13%), Art Metal-craft (9%) and Earths (0%). The seven content areas rated above 50% were Drafting, Metals, Power Sources, Electricity, Hot Metals, Mechanical Transmission and Fluid Transmission. The two additional content areas of General and Woods were ranked above the Other Canadian Institutions mean of 37%.

The ranked perception of program adequacy for the seventeen Group D (U.S.A. Institutions) content areas were; Woods (91%), Drafting (88%), General (86%), Plastics (84%), Metals (82%), Power Sources (78%), Leather-craft (77%), Electricity (73%), Hot Metals (67%), Printing (65%), Art Metal-craft (58%), Mechanical Transmission (46%), Lapidary-craft (46%), Electronics (43%), Photography (32%), Fluid Transmission (18%) and Earths (17%). The eleven content areas rated above 50% were Woods, Drafting, General, Plastics, Metals, Power Sources, Leather-craft, Electricity, Hot Metals, Printing and Art Metal-craft. The Group D mean was 59%.

The ranked perception of program adequacy for the seventeen Group E (Other Institutions) content areas were; Metals (100%), Art Metal-craft (100%), Drafting (93%),

General (89%), Woods (86%), Hot Metals (79%), Electricity (77%), Earths (67%), Printing (66%), Plastics (29%), Fluid Transmission (23%), Power Sources (0%), Mechanical Transmission (0%), Electronics (0%), Photography (0%), Leather-craft (0%), Lapidary-craft (0%). The nine content areas rated above 50% were Metals, Art Metal-craft, Drafting, General, Woods, Hot Metals, Electricity, Earths and Printing. The Group E mean was 50%.

It may be noted that the six content areas of General, Metals, Hot Metals, Woods, Drafting and Electricity were rated above the individual means of the four non-University of Alberta groups which indicates an apparent bias of those programs towards a materials oriented teacher education program.

In order for the hypothesis to be accepted, a value of adequate for more than 50% of the seventeen content areas (i.e. 9 areas), was decided upon.

Testing the data against this criterion resulted in Hypothesis 5 being accepted for Groups D (U.S.A. Institutions) and E (Other Institutions), and being rejected for Groups B (University of Alberta at Calgary) and C (Other Canadian Institutions).

Conclusion 5a. The majority of University of Alberta at Calgary educated teachers perceive as adequate their preparation in developing the competencies required to teach less than half of the seventeen of the industrial

arts content areas.

5b. The majority of teachers educated by other Canadian institutions perceive as adequate, their preparation in developing the competencies required to teach less than half of the seventeen industrial arts content areas.

5c. The majority of teachers educated in the United States of America perceive as adequate their preparation in developing the competencies required to teach more than half of the seventeen industrial arts content areas.

5d. The majority of teachers educated by other institutions perceive as adequate their preparation in developing the competencies required to teach more than half of the seventeen industrial arts content areas.

SUMMARY

This chapter reported the data obtained from 331 respondents who represented 80% of the industrial arts teachers in the Province. It was found that most teachers had been educated in Alberta, nearly one half at the University of Alberta. In the case of University of Alberta prepared teachers, an examination of the relationship between preparation courses completed, and perception of program adequacy indicated that irrespective of the quantity

of preparation courses completed, teachers perceived themselves adequately prepared to teach industrial arts to junior high school students. However, at the senior high school instructional level, only those teachers with preparation in fewer than four preparation courses, perceived themselves adequately prepared. Additional investigation of the University of Alberta prepared teachers disclosed that most had completed six or more preparation courses, and had taught industrial arts for periods up to five years. It may be noted that this sub-group (i.e. six or more courses) was the only one that perceived themselves inadequately prepared to teach industrial arts at the senior high school level.

Preparation in developing the competencies needed to teach the majority of industrial arts content areas was not perceived as being adequate by University of Alberta educated teachers. On the basis of quantity of university preparation, teachers who had completed six or more industrial arts preparation courses at the University of Alberta appeared to value their preparation more than did teachers who had completed fewer preparation courses.

Teachers educated at institutions other than the University of Alberta, perceived their preparation as being adequate to teach industrial arts to both junior high and senior high school students, while only those teachers educated at either the United States of America or other

non-Canadian institutions perceived their preparation as being adequate in developing the majority of the specialized competencies needed to teach the industrial arts content areas.

It may be noted that teachers educated in Canada felt that their content preparation was inadequate, while those teachers educated outside Canada perceived their preparation as being adequate.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

SUMMARY

The purpose of the study was to obtain data which may be used to modify industrial arts teacher education programs that are preparing industrial arts teachers for Alberta schools. To achieve this aim, the study attempted to determine the extent to which Alberta industrial arts teachers perceived the value of various aspects of their teacher education programs in developing the specialized competencies required to teach the Department of Education Program of Studies for Industrial Arts in Alberta schools.

As the University of Alberta is conducting the only program specifically designed to prepare industrial arts teachers for Alberta schools at the present time, the major emphasis of the study was directed towards assessing that program. Relevant literature was reviewed, which disclosed several theoretical approaches to the task of curriculum evaluation. Because the University of Alberta program was well established, a product or outcome oriented model of evaluation was deemed appropriate to the needs of this study. Reference to the Department of Education Program of Studies for Industrial Arts led to a total of 206

competencies being identified as being representative of industrial arts content.

A questionnaire was developed and distributed to all 414 industrial arts teachers in Alberta, of whom 331 (80%) replied. The composition of the industrial arts teaching force was thus ascertained, and it was found that the majority of teachers had been educated in Alberta, nearly one half in the University of Alberta industrial arts teacher education program.

The study examined five research questions, and found that:

1. The majority of University of Alberta educated teachers perceived themselves adequately prepared to teach industrial arts to junior high school students, but inadequately prepared to teach industrial arts to senior high school students.
2. The majority of University of Alberta educated teachers perceived themselves adequately prepared to teach less than half of the seventeen industrial arts content areas.
3. The majority of University of Alberta educated teachers who completed six or more industrial arts preparation courses valued their preparation higher, than did teachers who completed fewer content courses.
4. The majority of non-University of Alberta educated teachers perceived themselves adequately prepared to

teach industrial arts to both junior high and senior high school students.

5. The majority of teachers educated outside Canada perceived themselves adequately prepared to teach half or more of the seventeen industrial arts content areas, while teachers educated within Canada felt adequately prepared to teach less than half of the seventeen industrial arts content areas.

DISCUSSION

The study disclosed that the University of Alberta program endeavored to provide preparation for more of the industrial arts content areas than did other preparatory programs. However, not all of the content areas prescribed by the Department of Education are accounted for in this program. Data have been obtained which can identify the specific competencies for which University of Alberta preparation was perceived as being either adequate or inadequate (Tables 7 to 23, Appendix 1). It follows that a competency perceived as 'adequate' may be regarded as a strength of the teacher education program. Similarly, a competency perceived as being 'inadequate' may be regarded as a weakness of the program. Therefore, the 206 competencies may be categorized as either program strengths or weaknesses. By matching the perceived weaknesses against

the assumed program objectives, specific competencies which appear to have been covered in insufficient depth may be located. Such information could then be used to further develop the University of Alberta program.

The results of the study have also provided base line data establishing the perceived worth of programs which have prepared Alberta industrial arts teachers. It is difficult to make judgments about the value of the University of Alberta program in relation to the other preparatory programs. Because the research instrument originated from the University of Alberta it is possible that the responses of graduates of that program may have been unusually critical and candid, due to a desire to provide evaluative feedback which could be used to improve that program. Conversely, graduates of non-University of Alberta programs may have been less critical (or more protective) of their particular teacher education program. Therefore, the finding that the perceived adequacy mean of the University of Alberta program was 36%, as compared to 37% and 59% for the University of Alberta at Calgary and United States of America programs respectively, must be treated with caution, i.e. it does not necessarily follow that programs which prepared industrial arts teachers in the United States of America were superior to the University of Alberta program. Although the same questionnaire was used to investigate the various preparatory programs, the possible effects of the

following factors should be considered:

1. The majority (92) of University of Alberta educated industrial arts teachers had taught for five or less years as compared to University of Alberta at Calgary prepared teachers who had taught industrial arts for more than nine years. The relationship between experience and opinion of program worth was not examined, as a major part of the study was concerned with only the University of Alberta program. However, it is recognized that the teaching experience of non-Alberta educated teachers does range over a greater time period, which may have affected their perception.
2. Because the study originated in Edmonton, it is possible that University of Alberta graduates may have been more candid in their opinions than graduates of other programs.
3. With the exception of teachers from either the University of Alberta or the University of Alberta at Calgary, who represent 46% and 18% of the sample respectively, the actual number of teachers from other educational institutions was small, (i.e. Other Canadian Institutions 4%, U.S.A. Institutions 11%, Other Institutions 2%), thereby making comparisons unreliable.

In the case of the University of Alberta, it becomes evident that the program developed along a broad base,

possibly at the cost of depth in preparation, for graduates viewed themselves as being inadequately prepared to teach industrial arts to senior high school students. Although it should be remembered that when the program was originally developed in 1963, it was designed to prepare junior high school industrial arts teachers within a two year time period. No information has been located to indicate that years three and four of the program were specifically designed to prepare teachers to instruct at the senior high school level. However those teachers who completed two to three and one half content courses (i.e. two years of the program), and who possessed post secondary experience prior to entry to the program, viewed themselves as being better able to teach senior high school industrial arts than teachers who completed more content courses. Therefore it is possible that post secondary education obtained prior to entry to the University of Alberta program may be of value, although no evidence has been obtained to support this suggestion. The fact that University of Alberta graduates had generally taught for five or less years should result in their perceptions of the program being recalled accurately, although no evidence has been obtained to indicate that perception of program worth was affected by teaching experience.

The University of Alberta at Calgary program which began to phase out in 1965, provided in-depth preparation in

the basic areas of Metals, Woods, Drafting and Electricity. Program graduates viewed themselves as being adequately prepared to teach industrial arts to both junior high and senior high school students. It must be remembered that those teachers had taught industrial arts for ten or more years. Their assessment of the program could be affected by the expertise which they subsequently may have acquired through teaching, although no evidence has been obtained to support this opinion.

The viewpoint of teachers educated in the United States of America is interesting. Those teachers experienced a variety of educational programs and generally each one had a very positive perceptions of his program's value, both in technical skill preparation and in professional education. A review of Table 24 (p.162) discloses that those teachers perceived their preparation in General Teaching Competencies (i.e. the professional component) to be of considerably more value than did teachers educated in Canada. Two possible explanations are plausible. Firstly, it may be that programs in the United States of America are in fact better able to prepare industrial arts teachers for the Alberta setting than any Canadian program. Secondly, the effect of being prepared in a country other than Canada may be that teachers have some trepidation when commencing a teaching career in Alberta. In such a situation, a teacher is likely to exert more than the usual amount of effort and

energy while developing an industrial arts program in a school. Subsequently, it may appear to him, that teaching in Alberta was less difficult than had been anticipated. Therefore, the teacher could form the impression that his preparation was superior, and the major reason for his effective teaching.

These suppositions could also explain the generally high ratings given by non-Canadian educated teachers, in comparison to the lower ratings given by Canadian educated industrial arts teachers. However, no evidence has been obtained to support either point of view.

OBSERVATIONS AND IMPLICATIONS

The purpose of this section of the study is to draw the attention of decision makers to factors which may affect future decisions related to the University of Alberta Industrial Arts Teacher Education Program. The observations which follow are drawn from information contained within Tables 7 to 23 (Appendix 1). The tables refer to University of Alberta educated teachers only, and relate their perception of program adequacy in developing the 206 competencies needed to teach the industrial arts content areas.

The competencies for which preparation was perceived as 'inadequate' (less than 50%) will be listed for each content

area, in order that observations can be made which may have implications for the University of Alberta Industrial Arts Teacher Education Program.

General Teaching Competencies. Reviewing Table 7 (p.145), which has an item range of 67% to 25% and a mean of 43%, reveals the following competencies rated as 'inadequate'.

The ability to;

- develop a laboratory safety program (49%)
- construct evaluative tests (48%)
- communicate with adolescents (38%)
- apply adolescent psychology theory (37%)
- motivate and/or discipline students (34%)
- inventory supplies and equipment (34%)
- identify procedure to follow in event of student accident or injury (31%)
- order supplies and equipment (30%)
- budget supplies and equipment (25%)

Deficiencies are perceived in developing the ability to interact effectively with secondary school students, handle student injury situations, to deal with laboratory supplies and equipment, and student testing procedures.

Power Sources Competencies. Reviewing Table 8 (p.146), which has an item range of 71% to 24% and a mean of 47%, reveals the following competencies rated as 'inadequate'.

The ability to;

- identify power output factors (40%)

- demonstrate the principles of carburetion, ignition, lubrication and cooling (39%)
- demonstrate and analyze types of electrical converters (36%)
- recognize limitations of piston and crankshaft type engines (33%)
- locate data on power-oriented career occupations (30%)
- organize and plan to teach the power area (24%)

Deficiencies are perceived in developing skill in the control and analysis of energy converters, the acquisition of career knowledge, and instructional planning procedures for this area.

Mechanical Transmission Competencies. Reviewing Table 9 (p.147), which has an item range of 57% to 19% and a mean of 31%, reveals that with the exception of the ability to determine torque and power, the eleven remaining competencies are rated as 'inadequate'. Major deficiencies are perceived in developing mechanical transmission competence. It would appear that the industrial arts preparation courses should be examined in order to determine whether this area is a desirable component of industrial arts teacher education, and if so, (a). whether by more effective utilization of its resources such preparation may be improved, or (b). if another institution (e.g. NAIT) should prepare teachers for this area.

Metals Competencies. Reviewing Table 10 (p.148), which has

an item range of 69% to 18% and a mean of 39%, reveals the following competencies rated as 'inadequate'.

The ability to;

- demonstrate safety precautions used when fabricating metal (46%)
- design, layout and fabricate in metal (45%)
- organize and plan to teach the metals area (42%)
- locate data on metal-oriented career occupations (31%)
- demonstrate metal fastening techniques (31%)
- comparatively test hand and machine metalworking tools (26%)
- identify metals sources and extraction processes (25%)
- sharpen and adjust metalworking tool cutting edges (19%)
- demonstrate metal finishing techniques (18%)

Deficiencies are perceived in developing instructional planning procedures, career knowledge, metal fabrication fastening and finishing techniques, the identification of metals sources and extraction processes, and tool maintenance for this area.

Earth (ceramics) Competencies. Reviewing Table 11 (p.149), which has an item range of 66% to 9% and a mean of 44%, reveals the following competencies rated as 'inadequate'.

The ability to;

- organize and plan to teach the earth/ceramics area (49%)

- demonstrate earth/ceramic fastening techniques (48%)
- demonstrate safety precautions used when fabricating earth/ceramic materials (45%)
- adjust earth/ceramic fabrication machines (36%)
- locate data on earth/ceramics-oriented career occupations (31%)
- identify earths/ceramics sources and extraction processes (30%)
- comparatively test hand and machine earth/ceramic working tools (25%)
- comparatively test earth/ceramic samples (9%)

Deficiencies are perceived in developing instructional planning procedures, career knowledge, identification of earths sources and extraction processes, and material testing for this area.

Electronics Competencies. Reviewing Table 12 (p.150) which has an item range of 61% to 26% and a mean of 43%, reveals the following competencies rated as 'inadequate'.

The ability to;

- assemble and analyze a power supply (45%)
- demonstrate and analyze a superhet receiver (45%)
- assemble and analyze an amplifier (42%)
- demonstrate and analyze a public address system (40%)
- assemble and analyze an oscillator (37%)
- demonstrate and analyze a transmitter (37%)
- organize and plan to teach the electronics area (34%)

- assemble and analyze a detector (30%)
- locate data on electronics-oriented career occupations (26%)

Deficiencies are perceived in developing skill in the analysis of power supplies, receivers, amplifiers, public address, oscillator, transmitter and detector units, and also in the planning of instructional procedures, and the acquisition of career knowledge for this area.

Photography Competencies. Reviewing Table 13 (p.151), which has an item range of 84% to 26% and a mean of 60%, reveals the following competencies rated as 'inadequate'.

The ability to;

- identify composition and design factors (46%)
- locate data on photography-oriented career occupations (26%)

The major perceived deficiency is in developing career knowledge for this area.

Leather Craft, Art-metal Craft & Lapidary Craft Competencies

Reviewing Table 14 (p.152) reveals that all items were rated at 3%, while Table 15 (p.153) items ranged from 11% to 6% with a mean of 8%, and Table 23 (p.161) items ranged from 3% to 2% with a mean of 2%. The University of Alberta does not attempt to prepare teachers in these three areas therefore the concern is to determine, in conjunction with the Department of Education, whether such crafts are desirable components of industrial arts education, and if so, whether

steps should be taken to include preparation for their teaching in the program.

Fluid Transmission Competencies. Reviewing Table 16 (p.154) which has an item range of 64% to 16% and a mean of 48%, reveals the following competencies rated as 'inadequate'.

The ability to;

- demonstrate the concept of Pascal's law (48%)
- solve problems in area and pressure (48%)
- construct and analyze fluidic circuits (47%)
- organize and plan to teach the fluid transmission area (21%)
- locate data on fluid transmission-oriented career occupations (16%)

Deficiencies are perceived in developing skill in planning instructional procedures, and career knowledge for this area.

Woods Competencies. Reviewing Table 17 (p.155), which has an item range of 74% to 27% and a mean of 48%, reveals the following competencies rated as 'inadequate'.

The ability to;

- organize and plan to teach the woods area (49%)
- demonstrate wood fastening techniques (45%)
- demonstrate lumber sources and processing methods (41%)
- comparatively test hand and machine woodworking tools (38%)

- sharpen and adjust woodworking tool cutting edges (35%)
- demonstrate wood finishing techniques (32%)
- locate data on wood-oriented career occupations (29%)
- comparatively test wood samples (27%)

Deficiencies are perceived in developing instructional planning processes, wood fastening, finishing and testing techniques, tool maintenance, and career knowledge for this area.

Plastics Competencies. Reviewing Table 18 (p.156), which has an item range of 81% to 28% and a mean of 46%, reveals the following competencies rated as 'inadequate'.

The ability to;

- organize and plan to teach the plastics area (45%)
- demonstrate plastic fastening techniques (43%)
- demonstrate plastic finishing techniques (38%)
- adjust plastic fabrication machines (35%)
- comparatively test plastic samples (32%)
- locate data on plastics-oriented career occupations (30%)
- comparatively test plastics fabrication methods (28%)

Deficiencies are perceived in developing skill in planning of instructional procedures, fabrication and testing methods, and career knowledge for this area.

Electricity Competencies. Reviewing Table 19 (p.157), which has an item range of 68% to 24% and a mean of 47%, reveals

the following competencies rated as 'inadequate'.

The ability to;

- assemble and analyze a lighting circuit (48%)
- identify electrical safety precautions (48%)
- demonstrate electrical control devices (43%)
- assemble and analyze a heating circuit (39%)
- identify parts and function of an electric motor (38%)
- organize and plan to teach the electricity area (35%)
- locate data on electrical-oriented career occupations (31%)
- check electric motor operated equipment for adequate grounding (24%)

Deficiencies are perceived in developing skill in planning instructional procedures, electric motors and grounding, career knowledge, and safety, for this area.

Drafting Competencies. Reviewing Table 20 (p.158), which has an item range of 64% to 21% and a mean of 35%, reveals that with the exception of the ability to produce orthographic and pictorial drawings, the remaining ten competencies are rated as 'inadequate'. Major deficiencies are perceived in developing drafting competence, therefore the industrial arts preparation courses should be examined to determine whether this area is a desirable component of industrial arts teacher education, and if so, (a). whether by more effective utilization of its resources, such preparation may be improved, or (b). if another institution

(e.g. NAIT) should prepare teachers for this area.

Printing Competencies. Reviewing Table 21 (p.159), which has an item range of 73% to 26% and a mean of 47%, reveals the following competencies rated as 'inadequate'.

The ability to;

- prepare direct image; half-tone and line photographic masters (48%)
- produce a complete printed project (41%)
- organize and plan to teach the printing area (39%)
- locate data on printing-oriented career occupations (38%)
- demonstrate silk-screen printing (31%)
- identify types of printing papers and inks (30%)
- demonstrate multi-color printing (26%)

Deficiencies are perceived in developing skill in planning instructional procedures, career information, project, silk-screen and multi-color printing for this area.

Hot Metals Competencies. Reviewing Table 22 (p.160), which has an item range of 46% to 4% and a mean of 20%, reveals that all twelve competencies were rated as 'inadequate'.

The industrial arts preparation courses should be examined in order to determine whether this area is a desirable component of industrial arts teacher education, and if so,

(b). whether by more effective utilization of its resources such preparation may be improved, or (b). if another institution (e.g. NAIT) should prepare teachers for this

area.

Summary

Common to many of the industrial arts areas are the following perceived program inadequacies;

- the inability to interact with school students,
- the inability to plan industrial arts instructional procedures,
- inadequate knowledge of laboratory budget and control procedures,
- inadequate knowledge of career information,
- inadequate knowledge of first-aid and safety procedures,
- inadequate tool and machine maintenance skills,
- inadequate materials finishing skills.

These items are indicative of major deficiencies in the University of Alberta program. Of great concern is the perceived inability of pre-service industrial arts teachers to interact with school students, which implies that modification of the student teaching experience is needed. One method of developing closer contact with both junior and senior high school students may be to physically transport selected groups of students to the industrial arts teaching laboratories on campus, in order that pre-service teachers could develop both interactive and instructional skills in a supervised setting. Such an arrangement of course, would require close co-operation between participating school

boards, teachers, university faculty and students. Another modification could be to extend the amount of student teaching in schools. It may also be beneficial to spread this experience over more than two schools (one junior high, one senior high) which is the current practice.

Another serious deficiency is the perceived inability to plan pedagogical procedures. This situation may be remedied by either substantially improving this component within the existing program, or through the implementation of a separate industrial arts teaching methods course.

General weaknesses such as laboratory budgeting and control, locating related career information, developing first aid and safety procedures, combined with a lack of equipment maintenance and material finishing skills, forcefully imply the necessity to substantially improve instruction in these areas.

These implications are based on information collected from in-service industrial arts teachers who had attended the University of Alberta. The consistency of their perceptions is sufficient reason for decision makers to seriously consider their views, and to take steps to remedy these perceived major program defects.

CONCLUSIONS

The following conclusions may be reached from the study:

1. The University of Alberta program appears to be broader in scope than other programs as it attempts to provide preparation for twelve of the seventeen industrial arts content areas, which is more than other programs appear to attempt.
2. Specific strengths and weaknesses in competency preparation have been identified within the University of Alberta program.
3. Data has been provided to establish the perceived worth of programs which have prepared Alberta industrial arts teachers. However, the numerical values assigned as an indicator of the value of the various programs should not be used as a basis for comparison among the different programs.
4. University of Alberta graduates perceived their preparation as being inadequate to teach industrial arts to senior high school students.
5. Teachers educated outside Canada perceived their preparation as being of relatively higher value.

RECOMMENDATIONS

The preparation of industrial arts teachers in Alberta is an area which requires more research and development. This study examined only one aspect of that complex subject, namely, the extent to which industrial arts teachers in Alberta perceived the value of their program of preparation perceived in developing selected competencies.

Nevertheless, the results of the study have indicated some features of the University of Alberta program which require attention. The following recommendations are therefore made:

That the Department of Industrial and Vocational Education at the University of Alberta establish a curriculum review committee charged with the responsibility to:

1. Ensure that the University of Alberta industrial arts teacher education program is planned to develop at least the competencies required of a beginning industrial arts teacher in Alberta. This purpose may be achieved by;
 - a. identifying the competencies intended to be achieved via the industrial arts preparation courses,
 - b. identifying the competencies needed to teach industrial arts in Alberta secondary schools,
 - c. comparing both competency sets to locate

incongruencies,

d. critically examining the incongruent competencies to determine those which should be developed within the University of Alberta program,

e. revising the competency content of all industrial arts preparatory courses to ensure program articulation and continuity,

f. requesting industrial arts course instructors to develop course content compatible with the achievement of the agreed competencies.

2. Regularly assess the industrial arts courses in order to ensure that pre-determined standards are maintained.

3. Improve existing, and develop further communication links with the Alberta Teachers Association, Department of Education, School Systems and practising teachers in order that industrial arts information can be shared throughout the Province, thereby improving the stature of the discipline.

4. Conduct regular follow up surveys of program graduates to monitor the perceived worth of the program.

5. Determine whether entrants to the program should possess pre-determined industrial abilities as a pre-requisite.

SUGGESTIONS FOR FURTHER RESEARCH

As mentioned previously, the study was concerned with one aspect of industrial arts teacher preparation. However, during the course of the investigation, several related problems have become apparent, and are listed below as questions for further research.

1. Why was preparation for the senior high school level regarded as inadequate only by University of Alberta graduates?
2. Has the University of Alberta made effective use of the resources at its disposal?
3. Should the University of Alberta reduce the breadth of its offerings and concentrate on depth instead?
4. Is it reasonable to expect the University of Alberta to be able to develop all the competencies needed to teach industrial arts in Alberta?
5. Should the University of Alberta delegate the responsibility for industrial arts skill development to an institution such as the Northern Alberta Institute of Technology, and thereby only concentrate on the development of pedagogical skills?
6. Should industrial arts teachers be prepared to specialize in (say) either materials or technology related aspects of industrial arts?
7. Why do non-Canadian educated teachers perceive their

preparation as being of more value than do teachers educated in Canada?

8. Do program entrants who possess industrial skills derive more benefit from the University of Alberta program than entrants without such abilities?

Answers to these questions may be obtained through the completion of a series of carefully planned and conducted research studies.

CONCLUDING STATEMENT

The study developed and tested a method of curriculum evaluation which may be a useful aid in assessing an on-going program of teacher education. The method yields formative data which may lead to subsequent revision and improvement of such a program.

In addition to providing the basis of the research instrument, the set of industrial arts competencies may be useful to both practising and potential industrial arts teachers as a check list, to identify deficiencies in their own preparation which may require upgrading.

Finally, the study has raised several questions, which are listed as suggestions for further research.

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APPENDIX 1

Tables of Results

Table 7

University of Alberta Prepared Industrial Arts Teachers:
General Teaching Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by percentage)			
	(A)	(B)	(C)	(D) Total
-teach both individuals and small groups	40	75	67	67 67
-detect, isolate and/or remedy unsafe laboratory conditions	70	67	62	57 60
-develop a yearly instructional plan	50	71	46	54 55
-develop a daily instructional plan	40	75	54	46 51
-organize student personnel	30	50	46	54 51
-develop a laboratory safety program	60	54	42	48 49
-construct evaluative tests	70	62	37	46 48
-communicate with adolescents	30	54	42	34 38
-apply adolescent psychology theory	50	58	33	32 37
-motivate and/or discipline students	30	58	33	28 34
-inventory supplies and equipment	50	29	46	30 34
-identify procedure to follow in event of student injury	40	29	37	28 31
-order supplies and equipment	50	29	25	29 30
-budget supplies and equipment	40	29	21	24 25

Means	46	51	42	41 43
N	10	24	24	92 150

Note : letters in parentheses indicate the number of
Industrial Arts Preparation Courses Completed

(A) = 0.5 to 1.5 course equivalents

(B) = 2.0 to 3.5 course equivalents

(C) = 4.0 to 5.5 course equivalents

(D) = 6.0 or more course equivalents

Table 8

University of Alberta Prepared Industrial Arts Teachers:
Power Sources Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by percentage)			
	(A)	(B)	(C)	(D) Total
-identify sources of power and types of energy conversion	50	58	67	79 71
-demonstrate the concepts of work, energy, horsepower, torque	50	42	67	69 63
-demonstrate and analyze types of internal combustion converters	50	42	67	69 63
-identify practical applications of power sources	50	50	58	64 60
-demonstrate and analyze types of external combustion converters	0	50	33	67 54
-demonstrate and analyze types of direct mechanical converters	25	42	50	56 51
-identify power output factors	25	42	25	46 40
-demonstrate the principles of carburetion, ignition, lubrication and cooling	0	42	42	41 39
-demonstrate and analyze types of electrical converters	0	42	25	41 36
-recognize limitations of piston and crankshaft type engines	0	25	42	36 33
-locate data on power-oriented career occupations	25	33	25	31 30
-organize and plan to teach the power area	25	42	25	18 24

Means	25	43	44	51 47

N	4	12	12	39 67

Note : letters in parentheses indicate the number of Industrial Arts Preparation Courses Completed

- (A) = 0.5 to 1.5 course equivalents
 (B) = 2.0 to 3.5 course equivalents
 (C) = 4.0 to 5.5 course equivalents
 (D) = 6.0 or more course equivalents

Table 9

University of Alberta Prepared Industrial Arts Teachers:
Mechanical Transmission Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by percentage)			
	(A)	(E)	(C)	(D) Total
-calculate torque and power	0	50	58	64 57
-demonstrate the principle of mechanical advantage	0	33	33	49 40
-demonstrate the principles of directional changes in power transmission	0	50	25	46 40
-demonstrate and analyze gear and shaft type power transmission	0	25	25	44 35
-demonstrate and analyze types of clutching devices	0	25	25	33 28
-demonstrate the principles of screw, axle & wedge type power transmission	0	25	17	33 27
-demonstrate and analyze belt type power transmission	0	25	17	31 26
-demonstrate and analyze chain type power transmission	0	25	17	31 26
-demonstrate the principles of shaft, cable, cam & rod type power transmission	0	25	17	31 26
-demonstrate the principle of transmission efficiency	0	25	25	23 22
-locate data on mechanical transmission-oriented career occupations	0	25	25	23 22
-organize and plan to teach the mechanical transmission area	0	25	25	18 19
Means	0	30	26	36 31
N	4	12	12	39 67

Note : letters in parentheses indicate the number of Industrial Arts Preparation Courses Completed

- (A) = 0.5 to 1.5 course equivalents
 (B) = 2.0 to 3.5 course equivalents
 (C) = 4.0 to 5.5 course equivalents
 (D) = 6.0 or more course equivalents

Table 10

University of Alberta Prepared Industrial Arts Teachers:
Metals Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by percentage)			
	(A)	(B)	(C)	(D) Total
-demonstrate common metalworking machines	50	50	75	74 69
-identify and demonstrate common metalworking handtools	25	58	75	67 64
-comparatively test metal samples	50	58	58	56 56
-demonstrate safety precautions used when fabricating metal	25	50	75	38 46
-design, layout and fabricate in metal	50	42	42	46 45
-organize and plan to teach the metals area	0	50	50	41 42
-locate data on metal-oriented career occupations	0	33	42	31 31
-demonstrate metal fastening techniques	0	8	50	36 31
-comparatively test hand and machine metalworking tools	0	17	42	26 26
-identify metals sources and extraction processes	25	42	33	18 25
-sharpen and adjust metalworking tool cutting edges	0	8	42	18 19
-demonstrate metal finishing techniques	0	17	25	18 18

Means	19	36	51	39 39
N	4	12	12	39 67

Note : letters in parentheses indicate the number of
Industrial Arts Preparation Courses Completed

(A) = 0.5 to 1.5 course equivalents
(B) = 2.0 to 3.5 course equivalents
(C) = 4.0 to 5.5 course equivalents
(D) = 6.0 or more course equivalents

Table 11

University of Alberta Prepared Industrial Arts Teachers:
Earths (ceramics) Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by Percentage)			
	(A)	(B)	(C)	(D) Total
-identify and demonstrate common earth/ceramics handtools	50	75	58	67 66
-demonstrate common earth/ceramic machine tools	50	75	50	64 63
-demonstrate earth/ceramic finishing techniques	25	58	58	67 61
-design, layout and fabricate earth/ceramic materials	50	67	42	64 60
-organize and plan to teach the earths/ceramics area	25	58	50	49 49
-demonstrate earth/ceramic fastening techniques	25	42	50	51 48
-demonstrate safety precautions used when fabricating earth/ceramic materials	25	50	33	49 45
-adjust earth/ceramic fabrication machines	25	58	33	31 36
-locate data on earths/ceramics-oriented career occupations	25	25	33	33 31
-identify earths/ceramics sources and extraction processes	50	33	25	28 30
-comparatively test hand and machine earth/ceramic working tools	0	42	25	23 25
-comparatively test earth/ceramic samples	0	8	8	10 9
Means	29	49	39	45 44
N	4	12	12	39 67

Note : letters in parentheses indicate the number of Industrial Arts Preparation Courses Completed

- (A) = 0.5 to 1.5 course equivalents
 (B) = 2.0 to 3.5 course equivalents
 (C) = 4.0 to 5.5 course equivalents
 (D) = 6.0 or more course equivalents

Table 12

University of Alberta Prepared Industrial Arts Teachers:
Electronics Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by percentage)			
	(A)	(B)	(C)	(D) Total
-demonstrate electronic test equipment	25	58	67	64 61
-demonstrate the use of a computer to solve a problem	25	50	58	64 58
-identify and test electronic components	25	50	67	61 58
-assemble and analyze a power supply	0	42	58	46 45
-demonstrate and analyze a superhet receiver	25	58	50	41 45
-assemble and analyze an amplifier	0	33	50	46 42
-demonstrate and analyze a public address system	0	33	50	44 40
-assemble and analyze an oscillator	0	25	25	49 37
-demonstrate and analyze a transmitter	0	42	42	38 37
-organize and plan to teach the electronics area	0	33	42	36 34
-assemble and analyze a detector	0	25	17	38 30
-locate data on electronics-oriented career occupations	0	25	33	26 26
Means	8	40	47	46 43
N	4	12	12	39 67

Note : letters in parentheses indicate the number of
Industrial Arts Preparation Courses Completed

(A) = 0.5 to 1.5 course equivalents.

(B) = 2.0 to 3.5 course equivalents

(C) = 4.0 to 5.5 course equivalents

(D) = 6.0 or more course equivalents

Table 13

University of Alberta Prepared Industrial Arts Teachers:
Photography Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by percentage)			
	(A)	(B)	(C)	(D) Total
-load, unload and develop film	50	83	83	87 84
-demonstrate enlarging techniques	50	75	83	82 80
-identify photographic chemicals	50	75	75	74 73
-identify camera types, parts and functions	50	83	67	74 73
-demonstrate a light meter and electronic flash unit	25	75	67	64 64
-identify indoor photography factors	25	58	58	59 57
-identify outdoor photography factors	25	67	50	56 55
-organize and plan to teach the photography area	25	67	58	51 53
-identify film types and characteristics	50	75	50	49 52
-identify print paper types and characteristics	50	67	42	49 50
-identify composition and design factors	25	67	42	44 46
-locate data on photography-oriented career occupations	0	42	33	23 26

Means	35	70	59	59 60
N	4	12	12	39 67

Note : letters in parentheses indicate the number of
Industrial Arts Preparation Courses Completed

(A) = 0.5 to 1.5 course equivalents

(B) = 2.0 to 3.5 course equivalents

(C) = 4.0 to 5.5 course equivalents

(D) = 6.0 or more course equivalents

Table 14

University of Alberta Prepared Industrial Arts Teachers:
Leather Craft Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by Percentage)			
	(A)	(B)	(C)	(D) Total
-identify hides sources and processing methods	0	8	0	3 3
-identify commonly used leathers (natural and synthetic)	0	8	0	3 3
-comparatively test leather samples	0	8	0	3 3
-identify and demonstrate common leatherworking hand tools	0	8	0	3 3
-design, layout and fabricate in leather	0	8	0	3 3
-demonstrate safety precautions used when fabricating leather	0	8	0	3 3
-sharpen and adjust leather tool cutting edges	0	8	0	3 3
-demonstrate leather fastening techniques	0	8	0	3 3
-demonstrate leather finishing techniques	0	8	0	3 3
-comparatively test leather fabrication methods	0	8	0	3 3
-locate data on leather-oriented career occupations	0	8	0	5 3
-organize and plan to teach the leather area	0	8	0	3 3
Means				0 8 0 3 3
N				4 12 12 39 67

Note : letters in parentheses indicate the number of
Industrial Arts Preparation Courses Completed

- (A) = 0.5 to 1.5 course equivalents
(B) = 2.0 to 3.5 course equivalents
(C) = 4.0 to 5.5 course equivalents
(D) = 6.0 or more course equivalents

Table 15

University of Alberta Prepared Industrial Arts Teachers:
Art Metal Craft Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by percentage)			
	(A)	(B)	(C)	(D) Total
-identify commonly used non-ferrous metals	0	17	0	13 11
-design, layout and fabricate non-ferrous metal projects	0	25	0	10 10
-demonstrate safety precautions used when fabricating non-ferrous metal	0	17	8	10 10
-demonstrate non-ferrous metal fastening techniques	0	25	0	10 10
-sharpen and adjust non-ferrous metal tool cutting edges	0	25	0	8 9
-identify and demonstrate common non-ferrous metal working hand tools	0	17	0	8 8
-comparatively test non-ferrous metals samples	0	17	0	8 8
-demonstrate non-ferrous metal finishing techniques	0	17	0	8 8
-organize and plan to teach the art metals area	0	17	0	8 8
-identify non-ferrous metal and enamel sources and processing methods	0	25	0	3 6
-identify and demonstrate common non-ferrous metal working machine tools	0	8	0	8 6
-locate data on non-ferrous metal-oriented career occupations	0	17	0	5 6

Means	0	19	0	8 8
N	4	12	12	39 67

Note : letters in parentheses indicate the number of
Industrial Arts Preparation Courses Completed

(A) = 0.5 to 1.5 course equivalents
(B) = 2.0 to 3.5 course equivalents
(C) = 4.0 to 5.5 course equivalents
(D) = 6.0 or more course equivalents

Table 16

University of Alberta Prepared Industrial Arts Teachers:
Fluid Transmission Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by Percentage)			
	(A)	(B)	(C)	(D) Total
-construct and analyze a single-acting cylinder hydraulic circuit	17	58	42	75 64
-construct and analyze a double-acting cylinder hydraulic circuit	17	58	42	68 59
-demonstrate principles of flow; and properties of fluids	0	56	58	64 58
-demonstrate the use and operation of hydraulic valves	17	33	50	70 58
-demonstrate the principles of pneumatic circuits	17	25	50	65 54
-demonstrate the concept of pressure	17	58	50	57 53
-construct and analyze pneumatic circuits	17	25	50	63 52
-demonstrate the concept of Pascal's law	0	50	50	53 48
-solve problems in area and pressure	17	50	42	53 48
-construct and analyze fluidic circuits	17	42	50	51 47
-organize and plan to teach the fluid transmission area	17	17	25	21 21
-locate data on fluid transmission-oriented career opportunities	0	17	17	17 16
Means	13	41	44	55 48
N	6	12	12	53 83

Note : letters in parentheses indicate the number of Industrial Arts Preparation Courses Completed

- (A) = 0.5 to 1.5 course equivalents
 (B) = 2.0 to 3.5 course equivalents
 (C) = 4.0 to 5.5 course equivalents
 (D) = 6.0 or more course equivalents

Table 17

University of Alberta Prepared Industrial Arts Teachers:
Woods Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by percentage)			
	(A)	(E)	(C)	(D) Total
-demonstrate common woodworking machines	67	67	50	81 74
-demonstrate safety precautions used when fabricating wood	67	67	67	76 73
-identify and demonstrate common woodworking hand tools	67	50	50	77 68
-design, layout and fabricate in wood	50	58	67	62 61
-organize and plan to teach the woods area	50	50	75	42 49
-demonstrate wood fastening techniques	33	58	50	43 45
-identify lumber sources and processing methods	50	58	42	36 41
-comparatively test hand and machine woodworking tools	50	33	75	30 38
-sharpen and adjust woodworking tool cutting edges	50	42	67	25 35
-demonstrate wood finishing techniques	33	33	33	32 32
-locate data on wood-oriented career occupations	33	17	25	32 29
-comparatively test wood samples	50	33	25	23 27

	Means			
	50	47	52	47 48

	N			
	6	12	12	53 83

Note : letters in parentheses indicate the number of
Industrial Arts Preparation Courses Completed

- (A) = 0.5 to 1.5 course equivalents
- (B) = 2.0 to 3.5 course equivalents
- (C) = 4.0 to 5.5 course equivalents
- (D) = 6.0 or more course equivalents

Table 18

University of Alberta Prepared Industrial Arts Teachers:
Plastics Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by Percentage)			Total
	(A)	(B)	(C)	
-demonstrate common plastic fabricating machines	50	58	92	88
-identify and demonstrate common plastics handtools	50	58	67	57
-design, layout and fabricate in plastic	50	42	67	53
-demonstrate safety precautions used when fabricating plastic	50	50	42	55
-identify plastics sources and production methods	33	50	58	51
-organize and plan to teach the plastics area	50	42	75	38
-demonstrate plastic fastening techniques	50	42	42	42
-demonstrate plastic finishing techniques	50	25	25	42
-adjust plastic fabrication machines	50	42	25	34
-comparatively test plastic samples	33	50	42	26
-locate data on plastics-oriented career occupations	50	25	33	28
-comparatively test plastics fabrication methods	50	33	33	24
	47	43	50	45
Means				
	6	12	12	53
N				83

Note : letters in parentheses indicate the number of
Industrial Arts Preparation Courses Completed

- (A) = 0.5 to 1.5 course equivalents.
(B) = 2.0 to 3.5 course equivalents
(C) = 4.0 to 5.5 course equivalents
(D) = 6.0 or more course equivalents

Table 19

University of Alberta Prepared Industrial Arts Teachers:
Electricity Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by percentage)			
	(A)	(E)	(C)	(D) Total
-demonstrate the measurement voltage, current and resistance	33	50	67	77 68
-assemble and analyze a series circuit	50	58	58	70 65
-assemble and analyze a parallel circuit	50	58	58	70 65
-demonstrate sources of electricity	33	50	50	58 54
-assemble and analyze a lighting circuit	33	50	50	49 48
-identify electrical safety precautions	50	50	50	47 48
-demonstrate electrical control devices	33	50	42	43 43
-assemble and analyze a heating circuit	33	50	42	36 39
-identify parts and function of an electric motor	17	58	8	42 38
-organize and plan to teach the electricity area	33	42	50	30 35
-locate data on electrical-oriented career occupations	17	33	33	32 31
-check electric motor operated equipment for adequate grounding	33	25	25	23 24

Means	35	48	44	48 47
N	6	12	12	53 83

Note : letters in parentheses indicate the number of Industrial Arts Preparation Courses Completed

- (A) = 0.5 to 1.5 course equivalents
 (B) = 2.0 to 3.5 course equivalents
 (C) = 4.0 to 5.5 course equivalents
 (D) = 6.0 or more course equivalents

Table 20

University of Alberta Prepared Industrial Arts Teachers:
Drafting Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by percentage)			
	(A)	(B)	(C)	(D) Total
-produce an orthographic drawing	50	50	58	70 64
-produce a pictorial drawing	50	33	25	64 53
-produce a freehand sketch	50	50	25	43 42
-demonstrate mechanical drafting processes	50	50	25	42 41
-describe and demonstrate common copying machines	50	33	25	40 38
-produce a sectional drawing	50	33	17	32 31
-produce a tracing or a print of a drawing	50	17	17	34 30
-organize and plan to teach the drafting area	33	25	17	26 25
-locate data on drafting-oriented career occupations	33	17	8	28 24
-produce a sheet-metal drawing	50	8	8	28 24
-produce a machine drawing	33	33	8	23 23
-produce an architectural drawing	33	17	8	23 21

Means	44	31	20	38 35
N	6	12	12	53 83

Note : letters in parentheses indicate the number of
Industrial Arts Preparation Courses Completed

- (A) = 0.5 to 1.5 course equivalents
(B) = 2.0 to 3.5 course equivalents
(C) = 4.0 to 5.5 course equivalents
(D) = 6.0 or more course equivalents

Table 21

University of Alberta Prepared Industrial Arts Teachers:
Printing Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by Percentage)			
	(A)	(B)	(C)	(D) Total
-demonstrate a platen press	33	58	92	77 73
-set type	33	42	75	77 68
-demonstrate an offset press	17	67	75	70 66
-prepare layouts for the various printing processes	33	50	75	53 54
-describe types of mechanical printing processes	33	50	58	51 51
-prepare direct image; half-tone and line photographic masters	17	50	50	51 48
-produce a complete printed project (e.g. a year book)	17	50	42	42 41
-organize and plan to teach the printing area	17	42	42	40 39
-locate data on printing-oriented career opportunities	17	33	33	42 38
-demonstrate silk-screen printing	17	25	33	34 31
-identify types of printing papers and inks	33	42	25	28 30
-demonstrate multi-color printing	0	33	33	26 26
Means	22	45	53	49 47
N	6	12	12	53 83

Note : letters in parentheses indicate the number of
Industrial Arts Preparation Courses Completed

(A) = 0.5 to 1.5 course equivalents
(B) = 2.0 to 3.5 course equivalents
(C) = 4.0 to 5.5 course equivalents
(D) = 6.0 or more course equivalents

Table 22

University of Alberta Prepared Industrial Arts Teachers:
Hot Metals Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by percentage)			
	(A)	(B)	(C)	(D) Total
-demonstrate sand casting techniques	17	50	42	49 46
-demonstrate safety precautions used when fabricating hot metal	33	42	25	38 36
-identify types of foundry equipment	17	50	25	26 29
-demonstrate mold making techniques	17	42	25	26 28
-demonstrate pattern making techniques	17	33	25	23 24
-design, layout and fabricate a hot metal project	33	17	25	26 24
-identify types of welding equipment	33	42	17	9 17
-organize and plan to teach the hot metals area	17	33	25	9 15
-locate data on hot metal-oriented career occupations	17	17	0	15 13
-demonstrate oxy-acetelene and arc welding techniques	17	25	8	0 6
-demonstrate cutting, brazing and silver soldering techniques	17	8	0	0 2
-comparatively test welding techniques	17	8	0	2 4
Means	20	31	18	19 20
N	6	12	12	53 83

Note : letters in parentheses indicate the number of
Industrial Arts Preparation Courses Completed

- (A) = 0.5 to 1.5 course equivalents
(B) = 2.0 to 3.5 course equivalents
(C) = 4.0 to 5.5 course equivalents
(D) = 6.0 or more course equivalents

Table 23

University of Alberta Prepared Industrial Arts Teachers:
Lapidary Craft Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by percentage)			
	(A)	(E)	(C)	(D) Total
-identify and demonstrate common lapidary hand tools	0	8	0	4 3
-identify rock sources and processing methods	0	8	0	2 2
-identify commonly used rocks	0	8	0	2 2
-comparatively test rock samples	0	8	0	2 2
-identify and demonstrate common lapidary machine tools	0	8	0	2 2
-design, layout and fabricate lapidary projects	0	8	0	2 2
-demonstrate safety precautions used when fabricating lapidary projects	0	8	0	2 2
-sharpen and adjust lapidary tool cutting edges	0	8	0	2 2
-demonstrate lapidary fastening techniques	0	8	0	2 2
-demonstrate lapidary finishing techniques	0	8	0	2 2
-locate data on lapidary-oriented career occupations	0	8	0	2 2
-organize and plan to teach the lapidary area	0	8	0	2 2

Means	0	8	0	2 2
N	6	12	12	53 83

Note : letters in parentheses indicate the number of
Industrial Arts Preparation Courses Completed

- (A) = 0.5 to 1.5 course equivalents
 (B) = 2.0 to 3.5 course equivalents
 (C) = 4.0 to 5.5 course equivalents
 (D) = 6.0 or more course equivalents

Alberta Industrial Arts Teachers General Teaching Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by percentage)				
	(A)	(B)	(C)	(D)	(E) Total
-apply adolescent psychology theory	37	53	43	89	100 50
-communicate with adolescents	38	38	50	92	100 48
-motivate and/or discipline students	34	52	36	81	100 47
-teach both individuals and small groups	67	60	50	92	100 69
-detect, isolate and/or remedy unsafe laboratory conditions	60	78	50	92	100 69
-identify procedure to follow in event of student injury	31	50	43	95	88 46
-develop a laboratory safety program	49	65	36	86	100 58
-develop a daily instructional plan	51	62	71	89	100 61
-develop a yearly instructional plan	55	60	71	89	100 63
-inventory supplies and equipment	34	60	43	78	88 48
-order supplies and equipment	30	40	29	81	88 41
-budget supplies and equipment	25	33	29	76	75 35
-organize student personnel	51	58	57	86	100 59
-construct evaluative tests	48	62	79	86	100 60
Means	44	55	49	86	89 54
N	150	60	14	37	8 269

Note: letters in parentheses indicate preparation institution.

- (A) = University of Alberta
 (B) = University of Alberta at Calgary
 (C) = Other Canadian Institutions
 (D) = U.S.A. Institutions
 (E) = Other Institutions

Table 25

Alberta Industrial Arts Teachers Power Sources Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by percentage)				
	(A)	(B)	(C)	(D)	(E) Total
-identify sources of power and types of energy conversion	71	45	100	90	0 68
-demonstrate the concepts of work, energy, horsepower, torque	63	45	83	80	0 62
-demonstrate and analyze types of direct mechanical converters	51	39	50	65	0 50
-demonstrate and analyze types of external combustion converters	54	42	50	75	0 54
-demonstrate and analyze types of internal combustion converters	63	52	67	85	0 63
-demonstrate and analyze types of electrical converters	36	48	33	50	0 41
-demonstrate the principles of carburetion, ignition, lubrication and cooling	39	71	67	90	0 56
-identify power output factors	40	55	67	80	0 51
-recognize limitations of piston and crankshaft type engines	32	61	83	80	0 49
-identify practical applications of power sources	59	52	83	80	0 61
-locate data on power-oriented career occupations	30	32	33	80	0 38
-organize and plan to teach the power area	24	45	33	80	0 38
Means	47	49	62	78	0 53
N	67	31	6	20	1 125

Note: letters in parentheses indicate preparation institution.

- (A) = University of Alberta
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 (E) = Other Institutions

Table 26

Alberta Industrial Arts Teachers Mechanical Transmission Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by percentage)			
	(A)	(B)	(C)	(D) (E) Total
-demonstrate the principle of mechanical advantage	40	42	67	60 0 45
-demonstrate the principles of directional changes in power transmission	40	55	67	60 0 48
-demonstrate the principle of transmission efficiency	22	45	83	45 0 34
-calculate torque and power	58	45	100	40 0 53
-demonstrate and analyze belt type power transmission	26	29	67	40 0 31
-demonstrate and analyze chain type power transmission	26	29	50	30 0 28
-demonstrate and analyze gear and shaft type power transmission	38	52	50	50 0 44
-demonstrate and analyze types of clutching devices	29	35	67	50 0 35
-demonstrate the principles of shaft, cable, cam & rcd type power transmission	25	26	50	45 0 29
-demonstrate the principles of screw, axle & wedge type power transmission	27	29	50	55 0 33
-locate data on mechanical transmission-oriented career occupations	22	23	17	40 0 25
-organize and plan to teach the mechanical transmission area	19	42	17	35 0 27
Means	31	38	57	46 0 36
N	67	31	6	20 1 125

Note: letters in parentheses indicate preparation institution.

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Table 27

Alberta Industrial Arts Teachers Metals Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by percentage)				
	(A)	(B)	(C)	(D)	(E) Total
-identify metals sources and extraction processes	25	77	67	75	100 49
-comparatively test metal samples	57	55	67	60	100 58
-identify and demonstrate common metalworking handtools	64	84	100	90	100 75
-demonstrate common metalworking machines	69	87	100	90	100 79
-design, layout and fabricate in metal	45	87	83	95	100 66
-demonstrate safety precautions used when fabricating metal	50	77	67	90	100 64
-comparatively test hand and machine metalworking tools	26	74	67	65	100 47
-sharpen and adjust metalworking tool cutting edges	19	77	83	85	100 48
-demonstrate metal fastening techniques	31	74	83	95	100 55
-demonstrate metal finishing techniques	18	65	33	80	100 41
-locate data on metal-oriented career occupations	32	42	67	80	100 44
-organize and plan to teach the metals area	42	65	50	80	100 54
Means	40	72	72	82	100 57
N	67	31	6	20	1 125

Note: letters in parentheses indicate preparation institution.

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 (D) = U.S.A. Institutions
 (E) = Other Institutions

Table 28

Alberta Industrial Arts Teachers Earths (ceramics) Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by Percentage)				
	(A)	(B)	(C)	(D)	(E) Total
-identify earths/ceramics sources and extraction processes	27	19	0	15	0 22
-comparatively test earth/ceramic samples	9	13	0	10	0 10
-identify and demonstrate common earth/ceramics handtools	66	29	0	25	100 47
-demonstrate common earth/ceramic machine tools	62	26	0	25	100 44
-design, layout and fabricate earth/ceramic materials	60	23	0	20	100 42
-demonstrate safety precautions used when fabricating earth/ceramic materials	45	23	0	15	100 33
-comparatively test hand and machine earth/ceramic working tools	25	16	0	15	100 21
-adjust earth/ceramic fabrication machines	36	19	0	20	0 27
-demonstrate earth/ceramic fastening techniques	48	16	0	15	100 33
-demonstrate earth/ceramic finishing techniques	61	19	0	15	100 41
-locate data on earths/ceramics-oriented career occupations	31	19	0	10	0 23
-organize and plan to teach the earths/ceramics area	49	19	0	15	100 34
Means	43	20	0	17	67 31
N	67	31	6	20	1 125

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Table 29

Alberta Industrial Arts Teachers Electronics Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by percentage)				Total
	(A)	(B)	(C)	(D)	(E)
-assemble and analyze a power supply	45	23	33	70	0
-assemble and analyze an amplifier	42	23	0	50	0
-assemble and analyze an oscillator	37	19	0	45	0
-assemble and analyze a detector	30	16	17	40	0
-identify and test electronic components	58	26	33	55	0
-demonstrate electronic test equipment	61	26	50	65	0
-demonstrate and analyze a superhet receiver	45	23	33	35	0
-demonstrate and analyze a transmitter	37	23	33	35	0
-demonstrate and analyze a public address system	40	16	0	30	0
-demonstrate the use of a computer to solve a problem	58	10	17	15	0
-locate data on electronics-oriented career occupations	26	13	0	40	0
-organize and plan to teach the electronics area	34	19	0	30	0

Means	43	20	18	43	0
N	67	31	6	20	1
125					

Note: letters in parentheses indicate preparation institution.

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Table 30

Alberta Industrial Arts Teachers Photography Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by percentage)				Total
	(A)	(B)	(C)	(D)	(E)
-identify composition and design factors	48	19	33	30	0
-identify indoor photography factors	56	16	33	35	0
-identify outdoor photography factors	55	19	33	35	0
-identify film types and characteristics	54	19	17	25	0
-identify print paper types and characteristics	51	23	17	30	0
-identify camera types, parts and functions	73	19	50	35	0
-demonstrate a light meter and electronic flash unit	64	19	33	35	0
-load, unload and develop film	83	19	33	35	0
-demonstrate enlarging techniques	74	23	33	35	0
-identify photographic chemicals	73	16	33	30	0
-locate data on photography-oriented career occupations	26	16	17	30	0
-organize and plan to teach the photography area	53	13	17	30	0
Means	59	18	29	32	0
N	67	31	6	20	1

Note: letters in parentheses indicate preparation institution.

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Table 31

Alberta Industrial Arts Teachers Leather Craft Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by percentage)				
	(A)	(B)	(C)	(D)	(E) Total
-identify hides sources and processing methods	3	13	0	75	0 17
-identify commonly used leathers (natural and synthetic)	3	16	0	80	0 18
-comparatively test leather samples	3	6	0	65	0 13
-identify and demonstrate common leatherworking hand tools	3	19	33	80	0 21
-design, layout and fabricate in leather	3	19	33	80	0 21
-demonstrate safety precautions used when fabricating leather	3	19	17	80	0 20
-sharpen and adjust leather tool cutting edges	3	19	17	80	0 20
-demonstrate leather fastening techniques	3	23	33	80	0 22
-demonstrate leather finishing techniques	3	16	17	80	0 19
-comparatively test leather fabrication methods	3	13	0	75	0 17
-locate data on leather-oriented career occupations	3	19	0	75	0 18
-organize and plan to teach the leather area	3	16	0	75	0 18
Means	3	17	13	77	0 19
N	67	31	6	20	1 125

Note: letters in parentheses indicate preparation institution.

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Table 32

Alberta Industrial Arts Teachers Art Metal Craft Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by percentage)				
	(A)	(B)	(C)	(D)	(E) Total
-identify non-ferrous metal and enamel sources and processing methods	6	29	0	55	100 20
-identify commonly used non-ferrous metals	10	42	17	65	100 28
-comparatively test non-ferrous metals samples	7	29	0	50	100 20
-identify and demonstrate common non-ferrous metal working hand tools	8	35	17	60	100 24
-identify and demonstrate common non-ferrous metal working machine tools	6	35	0	60	100 22
-design, layout and fabricate non-ferrous metal projects	10	39	17	60	100 26
-demonstrate safety precautions used when fabricating non-ferrous metal	10	45	0	55	100 26
-sharpen and adjust non-ferrous metal tool cutting edges	9	34	17	60	100 24
-demonstrate non-ferrous metal fastening techniques	8	42	17	65	100 27
-demonstrate non-ferrous metal finishing techniques	7	29	17	60	100 22
-locate data on non-ferrous metal-oriented career occupations	6	23	0	55	100 19
-organize and plan to teach the art metals area	7	29	0	50	100 20
Means					8 34 9 58 100 23
N					67 31 6 20 1 125

Note: letters in parentheses indicate preparation institution.

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Table 33

Alberta Industrial Arts Teachers Fluid Transmission Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by percentage)			
	(A)	(B)	(C)	(D) (E) Total
-demonstrate the concept of Pascal's law	48	21	63	24 43 40
-solve problems in area and pressure	48	21	63	18 29 39
-demonstrate the concept of pressure	54	17	63	29 29 43
-demonstrate principles of flow; and properties of fluids	58	17	63	24 29 45
-construct and analyze a single-acting cylinder hydraulic circuit	64	17	63	18 14 47
-construct and analyze a double-acting cylinder hydraulic circuit	59	14	63	18 14 43
-demonstrate the use and operation of hydraulic valves	58	17	63	12 29 43
-demonstrate the principles of pneumatic circuits	53	10	50	18 29 39
-construct and analyze pneumatic circuits	52	0	38	12 14 34
-construct and analyze fluidic circuits	47	3	50	18 14 33
-locate data on fluid transmission-oriented career opportunities	16	3	38	12 14 14
-organize and plan to teach the fluid transmission area	21	7	38	12 14 18
Means	48	12	55	18 23 36
N	83	29	8	17 7 144

Note: letters in parentheses indicate preparation institution.

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Table 34

Alberta Industrial Arts Teachers Woods Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by Percentage)				
	(A)	(B)	(C)	(D)	(E) Total
-identify lumber sources and processing methods	41	93	50	82	86 59
-comparatively test wood samples	27	62	25	76	86 43
-identify and demonstrate common woodworking hand tools	69	100	50	94	86 78
-demonstrate common woodworking machines	74	93	50	100	86 80
-design, layout and fabricate in wood	62	90	50	100	86 73
-demonstrate safety precautions used when fabricating wood	71	86	50	94	86 76
-comparatively test hand and machine woodworking tools	31	79	38	82	86 50
-sharpen and adjust woodworking tool cutting edges	30	100	50	82	86 54
-demonstrate wood fastening techniques	46	100	50	100	86 65
-demonstrate wood finishing techniques	33	86	38	94	86 54
-locate data on wood-oriented career occupations	29	59	38	82	86 45
-organize and plan to teach the woods area	48	79	63	100	86 63
Means	47	86	46	91	86 62
N	83	29	8	17	7 144

Note: letters in parentheses indicate preparation institution.

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Table 35

Alberta Industrial Arts Teachers Plastics Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by percentage)				
	(A)	(B)	(C)	(D)	(E) Total
-identify plastics sources and production methods	51	10	38	88	29 45
-comparatively test plastic samples	32	10	13	65	29 30
-identify and demonstrate common plastics handtools	58	21	13	88	29 50
-demonstrate common plastic fabricating machines	81	14	25	94	43 64
-design, layout and fabricate in plastic	53	17	13	100	29 48
-demonstrate safety precautions used when fabricating plastic	52	17	25	88	29 47
-comparatively test plastics fabrication methods	28	14	13	76	14 29
-adjust plastic fabrication machines	35	17	25	82	28 36
-demonstrate plastic fastening techniques	43	17	38	82	14 41
-demonstrate plastic finishing techniques	38	17	38	88	28 39
-locate data on plastics-oriented career occupations	30	10	25	71	28 30
-organize and plan to teach the plastics area	45	17	38	88	43 44
Means	46	15	25	84	29 42
N	83	29	8	17	7 144

Note: letters in parentheses indicate preparation institution.

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Table 36

Alberta Industrial Arts Teachers Electricity Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by percentage)				
	(A)	(B)	(C)	(D)	(E) Total
-demonstrate sources of electricity	54	83	75	76	71 64
-demonstrate the measurement voltage, current and resistance	68	86	75	82	71 74
-assemble and analyze a heating circuit	39	52	63	82	86 50
-assemble and analyze a lighting circuit	48	93	50	82	86 63
-identify parts and function of an electric motor	38	76	63	71	71 53
-check electric motor operated equipment for adequate grounding	24	59	50	47	57 37
-identify electrical safety precautions	48	62	63	76	86 59
-assemble and analyze a series circuit	65	93	75	82	86 74
-assemble and analyze a parallel circuit	65	97	63	82	86 74
-demonstrate electrical control devices	43	66	50	76	86 54
-locate data on electrical-oriented career occupations	31	41	38	59	71 39
-organize and plan to teach the electricity area	35	55	65	59	71 45
Means	47	72	61	73	77 57
N	83	29	8	17	7 144

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Table 37

Alberta Industrial Arts Teachers Drafting Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by percentage)				
	(A)	(B)	(C)	(D)	(E) Total
-demonstrate mechanical drafting processes	41	97	75	88	100 63
-produce a freehand sketch	42	93	88	82	100 62
-produce an orthographic drawing	64	100	88	94	86 77
-produce a pictorial drawing	53	97	88	82	86 69
-produce a sectional drawing	31	97	88	94	100 58
-produce a machine drawing	23	79	88	94	100 50
-produce an architectural drawing	21	79	50	88	100 46
-produce a sheet-metal drawing	24	90	88	82	100 51
-produce a tracing or a print of a drawing	30	90	63	94	86 54
-describe and demonstrate common copying machines	38	59	50	94	86 52
-locate data on drafting-oriented career occupations	24	48	63	74	86 40
-organize and plan to teach the drafting area	25	76	63	88	86 48
Means	35	84	74	88	93 56
N	83	29	8	17	7 144

Note: letters in parentheses indicate preparation institution.

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Table 38
Alberta Industrial Arts Teachers Printing Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by percentage)				
	(A)	(B)	(C)	(D)	(E) Total
-prepare layouts for the various printing processes	54	10	38	82	71 48
-identify types of printing papers and inks	30	3	25	82	71 32
-set type	69	14	38	82	71 58
-demonstrate a platen press	73	14	38	71	71 59
-demonstrate silk-screen printing	31	10	25	71	57 32
-describe types of mechanical printing processes	51	3	25	71	71 43
-demonstrate multi-color printing	26	0	0	53	71 25
-demonstrate an offset press	66	10	25	65	71 53
-prepare direct image; half-tone and line photographic masters	48	3	25	59	71 40
-produce a complete printed project (e.g. a year book)	41	3	25	41	57 33
-locate data on printing-oriented career opportunities	38	3	38	47	43 32
-organize and plan to teach the printing area	39	7	50	59	71 37
Means	47	7	29	65	66 41
N	83	29	8	17	7 144

Note: letters in parentheses indicate preparation institution.

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Table 39

Alberta Industrial Arts Teachers Hot Metals Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by Percentage)			
	(A)	(B)	(C)	(D) (E) Total
-identify types of welding equipment	16	79	88	82 86 44
-demonstrate oxy-acetelene and arc welding techniques	6	83	75	82 86 38
-demonstrate cutting, brazing and silver soldering techniques	2	76	63	82 86 34
-comparatively test welding techniques	2	59	50	71 71 28
-identify types of foundry equipment	29	28	75	59 71 37
-demonstrate pattern making techniques	24	31	38	59 71 32
-demonstrate mold making techniques	28	28	38	59 71 34
-demonstrate sand casting techniques	46	28	63	53 71 45
-design, layout and fabricate a hot metal project	25	31	75	71 71 37
-demonstrate safety precautions used when fabricating hot metal	36	48	50	65 86 45
-locate data on hot metal-oriented career occupations	13	31	50	47 86 26
-organize and plan to teach the hot metals area	15	34	38	71 86 30
Means	20	46	59	67 79 36
N	83	29	8	17 7 144

Notes: letters in parentheses indicate preparation institution.

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 (D) = U.S.A. Institutions
 (E) = Other Institutions

Table 40

Alberta Industrial Arts Teachers Lapidary Craft Competencies by Perception of Program Adequacy

The ability to	Perceived Adequacy (by Percentage)				Total
	(A)	(B)	(C)	(D)	
-identify rock sources and processing methods	2	10	13	41	9
-identify commonly used rocks	2	10	25	47	10
-comparatively test rock samples	2	7	13	24	6
-identify and demonstrate common lapidary hand tools	3	10	13	53	11
-identify and demonstrate common lapidary machine tools	2	10	13	53	10
-design, layout and fabricate lapidary projects	2	7	13	53	10
-demonstrate safety precautions used when fabricating lapidary projects	2	10	13	53	10
-sharpen and adjust lapidary tool cutting edges	2	7	13	41	8
-demonstrate lapidary fastening techniques	2	10	13	53	10
-demonstrate lapidary finishing techniques	2	10	13	53	10
-locate data on lapidary-oriented career occupations	2	7	13	41	8
-organize and plan to teach the lapidary area	2	7	13	41	8

Means	2	9	14	46	9
N	83	29	8	17	144

Note: letters in parentheses indicate preparation institution.

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APPENDIX 2

Research Instrument

FORM A

NAME.....(optional)

SCHOOL.....(optional)

DEGREES/DIPLOMAS held.....

ALBERTA TEACHING CERTIFICATION (circle one)

(Interim S) (Interim Professional) (Permanent Professional)

ALBERTA INDUSTRIAL ARTS TEACHING EXPERIENCE (circle one)

0 1 2 3 4 5 6 7 8 9 more (years)

WHICH TEACHER EDUCATION INSTITUTION(S) HAVE YOU ATTENDED?

1

2

3

4

OF THESE INSTITUTION(S), WHICH ONE DO YOU FEEL BEST
PREPARED YOU TO TEACH ALBERTA INDUSTRIAL ARTS?

.....

PLEASE INDICATE THE WAY YOU FEEL ABOUT THE VALUE OF THAT
PROGRAM

AS PREPARATION TO TEACH: (circle appropriate response)

Junior High Industrial Arts

- (1) no value
- (2) most inadequate
- (3) inadequate
- (4) adequate
- (5) most adequate
- (6) excellent

Senior High Industrial Arts

- (1) no value
- (2) most inadequate
- (3) inadequate
- (4) adequate
- (5) most adequate
- (6) excellent

HAD YOU EXPERIENCED ANY OF THE FOLLOWING ACTIVITIES
PRIOR TO COMMENCING YOUR TEACHER EDUCATION PROGRAM?
 (circle more than one, if applicable)

Hobbies :

Power Mechanics	(yes	no)
Materials (Wood, metal, etc.)	(yes	no)
Electronics	(yes	no)
Photography	(yes	no)
Crafts	(yes	no)

Specify

.....

.....

Secondary Education :

Junior High I.A.	(yes	no)
Senior High I.A.	(yes	no)
Vocational Courses	(yes	no)

Specify

.....

.....

Post-secondary Education :

College or Institute of Technology	(yes	no)
Hold journeyman's papers	(yes	no)

(if yes, what field/s?)

HAVE YOU COMPLETED ANY OF THE FOLLOWING UNIVERSITY
 OF ALBERTA INDUSTRIAL ARTS COURSES?

(circle more than one, if applicable)

ED.IA. 203 (history of I.A.)	(yes	no)
ED.IA. 260 (introduction to materials)	(yes	no)
ED.IA. 270 (introduction to technology)	(yes	no)
ED.IA. 360 (man & technology)	(yes	no)
ED.IA. 370 (electronics & computer)	(yes	no)
ED.IA. 460 (materials & power technology)	(yes	no)
ED.IA. 470 (graphics & mechanical technology)	(yes	no)
EDIND 211 (metals 1)	(yes	no)
EDIND 213 (wood, plastic, earth 1)	(yes	no)
EDIND 233 (power 1)	(yes	no)
EDIND 235 (graphics 1)	(yes	no)
EDIND 237 (electronics 1)	(yes	no)
EDIND 391 (multiple activity 1)	(yes	no)
EDIND 392 (I.A. for elementary teachers)	(yes	no)
EDIND 395 (man & technology 1)	(yes	no)
EDIND 412 (metals 2)	(yes	no)
EDIND 416 (wood, plastic, earth 2)	(yes	no)
EDIND 434 (power 2)	(yes	no)
EDIND 438 (electronics & computer 2)	(yes	no)
EDIND 457 (multiple activity 2)	(yes	no)
EDIND 477 (man & technology 2)	(yes	no)
EDIND 496 (Individual directed study)	(yes	no)
EDIND 497 (curriculum development)	(yes	no)
EDIND 498 (individual directed laboratory study)	(yes	no)
OTHER		

***** PLEASE NOTE *****

This section aims to determine how effectively the program of teacher education that you completed, developed specific industrial arts abilities. 206 items have been identified, which are representative of the abilities required to teach Industrial Arts in Alberta schools.

For convenience, these items have been separated into two sets:-

SET_A

POWER SOURCES

MECHANICAL TRANSMISSION

METALS

EARTHS

ELECTRONICS

PHOTOGRAPHY

LEATHER-CRAFT

ART METAL-CRAFT

SET_B

FLUID TRANSMISSION

WOODS

PLASTICS

ELECTRICITY

DRAFTING

PRINTING

HOT METALS

LAPIDARY-CRAFT

You are asked to respond to SET_A abilities, while other teachers will receive SET_B. In this way, information about all the industrial arts abilities will be obtained.

please answer EVERY question by CIRCLING the number in each column which indicates the way you feel about the value of the program of teacher preparation which BEST prepared you to teach Alberta Industrial Arts::

1=no value
2=most inadequate
3=inadequate
4=adequate
5=most adequate
6=excellent

GENERAL: What value was your program in preparing you to

-apply adolescent psychology theory

-communicate with adolescents

-motivate and/or discipline students

-teach both individuals and small groups

-detect, isolate and/or remedy unsafe laboratory conditions

-identify procedure to follow in event of student injury

-develop a laboratory safety program

-develop a daily instructional plan

-develop a yearly instructional plan

-inventory supplies and equipment

-order supplies and equipment

-budget supplies and equipment

-organize student personnel

-construct evaluative tests

<u>no value</u>	<u>excellent</u>					
(1 2 3 4 5 6)	(1	2	3	4	5	6)
(1 2 3 4 5 6)	(1	2	3	4	5	6)
(1 2 3 4 5 6)	(1	2	3	4	5	6)
(1 2 3 4 5 6)	(1	2	3	4	5	6)
(1 2 3 4 5 6)	(1	2	3	4	5	6)
(1 2 3 4 5 6)	(1	2	3	4	5	6)
(1 2 3 4 5 6)	(1	2	3	4	5	6)
(1 2 3 4 5 6)	(1	2	3	4	5	6)
(1 2 3 4 5 6)	(1	2	3	4	5	6)
(1 2 3 4 5 6)	(1	2	3	4	5	6)
(1 2 3 4 5 6)	(1	2	3	4	5	6)
(1 2 3 4 5 6)	(1	2	3	4	5	6)
(1 2 3 4 5 6)	(1	2	3	4	5	6)
(1 2 3 4 5 6)	(1	2	3	4	5	6)
(1 2 3 4 5 6)	(1	2	3	4	5	6)
(1 2 3 4 5 6)	(1	2	3	4	5	6)

<u>POWER SOURCES: What value was your program in preparing you to</u>	<u>no value</u>					<u>excellent</u>				
-identify sources of power and types of energy conversion	(1	2	3	4	5	6)				
-demonstrate the concepts of work, energy, horsepower, torque	(1	2	3	4	5	6)				
-demonstrate and analyze types of direct mechanical converters	(1	2	3	4	5	6)				
-demonstrate and analyze types of external combustion converters	(1	2	3	4	5	6)				
-demonstrate and analyze types of internal combustion converters	(1	2	3	4	5	6)				
-demonstrate and analyze types of electrical converters	(1	2	3	4	5	6)				
-demonstrate the principles of carburetion, ignition, lubrication and cooling	(1	2	3	4	5	6)				
-identify power output factors	(1	2	3	4	5	6)				
-recognize limitations of piston and crankshaft type engines	(1	2	3	4	5	6)				
-identify practical applications of power sources	(1	2	3	4	5	6)				
-locate data on power-oriented career occupations	(1	2	3	4	5	6)				
-organize and plan to teach the power area	(1	2	3	4	5	6)				
<u>MECHANICAL TRANSMISSION: What value was your program in preparing you to</u>										
-demonstrate the principle of mechanical advantage	(1	2	3	4	5	6)				
-demonstrate the principles of directional changes in power transmission	(1	2	3	4	5	6)				
-demonstrate the principle of transmission efficiency	(1	2	3	4	5	6)				
-calculate torque and power	(1	2	3	4	5	6)				
-demonstrate and analyze belt type power transmission	(1	2	3	4	5	6)				
-demonstrate and analyze chain type power transmission	(1	2	3	4	5	6)				
-demonstrate and analyze gear and shaft type power transmission	(1	2	3	4	5	6)				
-demonstrate and analyze types of clutching devices	(1	2	3	4	5	6)				
-demonstrate the principles of shaft, cable, cam & rod type power transmission	(1	2	3	4	5	6)				
-demonstrate the principles of screw, axle & wedge type power transmission	(1	2	3	4	5	6)				
-locate data on mechanical transmission-oriented career occupations	(1	2	3	4	5	6)				
-organize and plan to teach the mechanical transmission area	(1	2	3	4	5	6)				

Metals: What value was your program in preparing you to

	<u>no. value</u>					<u>excellent</u>
-identify metals sources and extraction processes	(1	2	3	4	5	6)
-comparatively test metal samples	(1	2	3	4	5	6)
-identify and demonstrate common metalworking handtools	(1	2	3	4	5	6)
-demonstrate common metalworking machines	(1	2	3	4	5	6)
-design, layout and fabricate in metal	(1	2	3	4	5	6)
-demonstrate safety precautions used when fabricating metal	(1	2	3	4	5	6)
-comparatively test hand and machine metalworking tools	(1	2	3	4	5	6)
-Sharpen and adjust metalworking tool cutting edges	(1	2	3	4	5	6)
-demonstrate metal fastening techniques	(1	2	3	4	5	6)
-demonstrate metal finishing techniques	(1	2	3	4	5	6)
-locate data on metal-oriented career occupations	(1	2	3	4	5	6)
-organize and plan to teach the metals area	(1	2	3	4	5	6)

Earths(Ceramics): What value was your program in preparing you to

	<u>no. value</u>					<u>excellent</u>
-identify earths/ceramics sources and extraction processes	(1	2	3	4	5	6)
-comparatively test earth/ceramic samples	(1	2	3	4	5	6)
-identify and demonstrate common earth/ceramics handtools	(1	2	3	4	5	6)
-demonstrate common earth/ceramic machine tools	(1	2	3	4	5	6)
-design, layout and fabricate earth/ceramic materials	(1	2	3	4	5	6)
-demonstrate safety precautions used when fabricating earth/ceramic materials	(1	2	3	4	5	6)
-comparatively test hand and machine earth/ceramic working tools	(1	2	3	4	5	6)
-adjust earth/ceramic fabrication machines	(1	2	3	4	5	6)
-demonstrate earth/ceramic fastening techniques	(1	2	3	4	5	6)
-demonstrate earth/ceramic finishing techniques	(1	2	3	4	5	6)
-locate data on earths/ceramics-oriented career occupations	(1	2	3	4	5	6)
-organize and plan to teach the earths/ceramics area	(1	2	3	4	5	6)

ELECTRONICS: What value was your program in preparing you to

-assemble and analyze a power supply	(1	2	3	4	5	6)
-assemble and analyze an amplifier	(1	2	3	4	5	6)
-assemble and analyze an oscillator	(1	2	3	4	5	6)
-assemble and analyze a detector	(1	2	3	4	5	6)
-identify and test electronic components	(1	2	3	4	5	6)
-demonstrate electronic test equipment	(1	2	3	4	5	6)
-demonstrate and analyze a superhet receiver	(1	2	3	4	5	6)
-demonstrate and analyze a transmitter	(1	2	3	4	5	6)
-demonstrate and analyze a public address system	(1	2	3	4	5	6)
-demonstrate the use of a computer to solve a problem	(1	2	3	4	5	6)
-locate data on electronics-oriented career occupations	(1	2	3	4	5	6)
-organize and plan to teach the electronics area	(1	2	3	4	5	6)

PHOTOGRAPHY: What value was your program in preparing you to

-identify composition and design factors	(1	2	3	4	5	6)
-identify indoor photography factors	(1	2	3	4	5	6)
-identify outdoor photography factors	(1	2	3	4	5	6)
-identify film types and characteristics	(1	2	3	4	5	6)
-identify print paper types and characteristics	(1	2	3	4	5	6)
-identify camera types, parts and functions	(1	2	3	4	5	6)
-demonstrate a light meter and electronic flash unit	(1	2	3	4	5	6)
-load, unload and develop film	(1	2	3	4	5	6)
-demonstrate enlarging techniques	(1	2	3	4	5	6)
-identify photographic chemicals	(1	2	3	4	5	6)
-locate data on photography-oriented career occupations	(1	2	3	4	5	6)
-organize and plan to teach the photography area	(1	2	3	4	5	6)

COMMENTS

FORM B

NAME.....(optional)

SCHOOL.....(optional)

DEGREES/DIPLOMAS held.....

ALBERTA TEACHING CERTIFICATION (circle one)

(Interim S) (Interim Professional) (Permanent Professional)

ALBERTA INDUSTRIAL ARTS TEACHING EXPERIENCE (circle one)

0 1 2 3 4 5 6 7 8 9 more (years)

WHICH TEACHER EDUCATION INSTITUTION(S) HAVE YOU ATTENDED?

1

2

3

4

OF THESE INSTITUTION(S), WHICH ONE DO YOU FEEL BEST
PREPARED YOU TO TEACH ALBERTA INDUSTRIAL ARTS?

.....

PLEASE INDICATE THE WAY YOU FEEL ABOUT THE VALUE OF THAT
PROGRAM

AS PREPARATION TO TEACH: (circle appropriate response)

Junior High Industrial Arts

- (1) no value
- (2) most inadequate
- (3) inadequate
- (4) adequate
- (5) most adequate
- (6) excellent

Senior High Industrial Arts

- (1) no value
- (2) most inadequate
- (3) inadequate
- (4) adequate
- (5) most adequate
- (6) excellent

HAD YOU EXPERIENCED ANY OF THE FOLLOWING ACTIVITIES
PRIOR TO COMMENCING YOUR TEACHER EDUCATION PROGRAM?

(circle more than one, if applicable)

Hobbies :

Power Mechanics	(yes	no)
Materials (Wood, metal, etc.)	(yes	no)
Electronics	(yes	no)
Photography	(yes	no)
Crafts	(yes	no)

Specify

.....

.....

Secondary Education :

Junior High I.A.	(yes	no)
Senior High I.A.	(yes	no)
Vocational Courses	(yes	no)

Specify

.....

.....

Post-secondary Education :

College or Institute of Technology	(yes	no)
Hold journeyman's papers	(yes	no)

(if yes, what field/s?)

HAVE YOU COMPLETED ANY OF THE FOLLOWING UNIVERSITY
OF ALBERTA INDUSTRIAL ARTS COURSES?

(circle more than one, if applicable)

ED.IA. 203 (history of I.A.)	(yes	no)
ED.IA. 260 (introduction to materials)	(yes	no)
ED.IA. 270 (introduction to technology)	(yes	no)
ED.IA. 360 (man & technology)	(yes	no)
ED.IA. 370 (electronics & computer)	(yes	no)
ED.IA. 460 (materials & power technology)	(yes	no)
ED.IA. 470 (graphics & mechanical technology)	(yes	no)
EDIND 211 (metals 1)	(yes	no)
EDIND 213 (wood, plastic, earth 1)	(yes	no)
EDIND 233 (power 1)	(yes	no)
EDIND 235 (graphics 1)	(yes	no)
EDIND 237 (electronics 1)	(yes	no)
EDIND 391 (multiple activity 1)	(yes	no)
EDIND 392 (I.A. for elementary teachers)	(yes	no)
EDIND 395 (man & technology 1)	(yes	no)
EDIND 412 (metals 2)	(yes	no)
EDIND 416 (wood, plastic, earth 2)	(yes	no)
EDIND 434 (power 2)	(yes	no)
EDIND 438 (electronics & computer 2)	(yes	no)
EDIND 457 (multiple activity 2)	(yes	no)
EDIND 477 (man & technology 2)	(yes	no)
EDIND 496 (Individual directed study)	(yes	no)
EDIND 497 (curriculum development)	(yes	no)
EDIND 498 (individual directed laboratory study)	(yes	no)
OTHER		

***** PLEASE NOTE *****

This section aims to determine how effectively the program of teacher education that you completed, developed specific industrial arts abilities. 206 items have been identified, which are representative of the abilities required to teach Industrial Arts in Alberta schools.

For convenience, these items have been separated into two sets:-

SET_A

POWER SOURCES

MECHANICAL TRANSMISSION

METALS

EARTHS

ELECTRONICS

PHOTOGRAPHY

LEATHER-CRAFT

ART METAL-CRAFT

SET_B

FLUID TRANSMISSION

WOODS

PLASTICS

ELECTRICITY

DRAFTING

PRINTING

HOT METALS

LAPIDARY-CRAFT

You are asked to respond to SET_B abilities, while other teachers will receive SET_A. In this way, information about all the industrial arts abilities will be obtained.

please answer EVERY question by CIRCLING the number in each column which indicates the way you feel about the value of the program of teacher preparation which BEST prepared you to teach Alberta Industrial Arts: :

1=no value
2=most inadequate
3=inadequate
4=adequate
5=most adequate
6=excellent

GENERAL: What value was your program in preparing you to

<u>no value</u>	<u>excellent</u>
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12	12
13	13
14	14
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80	80
81	81
82	82
83	83
84	84
85	85
86	86
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90	90
91	91
92	92
93	93
94	94
95	95
96	96
97	97
98	98
99	99
100	100

-apply adolescent psychology theory

	(1	2	3	4	5	6)
1	1	1	1	1	1	1
2	1	1	1	1	1	1
3	1	1	1	1	1	1
4	1	1	1	1	1	1
5	1	1	1	1	1	1
6	1	1	1	1	1	1

-communicate with adolescents

	(1	2	3	4	5	6)
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0

-motivate and/or discipline students

	(1	2	3	4	5	6)
1	1	1	1	1	1	1
2	1	1	1	1	1	1
3	1	1	1	1	1	1
4	1	1	1	1	1	1
5	1	1	1	1	1	1
6	1	1	1	1	1	1

-teach both individuals and small groups

(1 2 3 4 5 6)

-detect, isolate and/or remedy unsafe laboratory conditions

	(1	2	3	4	5	6)
1	1	1	1	1	1	1
2	1	1	1	1	1	1
3	1	1	1	1	1	1
4	1	1	1	1	1	1
5	1	1	1	1	1	1
6	1	1	1	1	1	1

-identify procedure to follow in event of student injury

	(1	2	3	4	5	6)
1	1	1	1	1	1	1
2	1	1	1	1	1	1
3	1	1	1	1	1	1
4	1	1	1	1	1	1
5	1	1	1	1	1	1
6	1	1	1	1	1	1

-develop a laboratory safety program

	(1	2	3	4	5	6)
1	1	1	1	1	1	1
2	1	1	1	1	1	1
3	1	1	1	1	1	1
4	1	1	1	1	1	1
5	1	1	1	1	1	1
6	1	1	1	1	1	1

-develop a daily instructional plan

	(1	2	3	4	5	6)
1	1	1	1	1	1	1
2	1	1	1	1	1	1
3	1	1	1	1	1	1
4	1	1	1	1	1	1
5	1	1	1	1	1	1
6	1	1	1	1	1	1

-develop a yearly instructional plan

	(1)	2	3	4	5	6
1	1	1	1	1	1	1
2	1	1	1	1	1	1
3	1	1	1	1	1	1
4	1	1	1	1	1	1
5	1	1	1	1	1	1
6	1	1	1	1	1	1

-inventory supplies and equipment

(1 2 3 4 5 6)

-order supplies and equipment

	(1	2	3	4	5	6
1	1	1	1	1	1	1
2	1	1	1	1	1	1
3	1	1	1	1	1	1
4	1	1	1	1	1	1
5	1	1	1	1	1	1
6	1	1	1	1	1	1

-budget supplies and equipment

(1 2 3 4 5 6)

-organize student personnel

	(1	2	3	4	5	6
1	1	1	1	1	1	1
2	1	1	1	1	1	1
3	1	1	1	1	1	1
4	1	1	1	1	1	1
5	1	1	1	1	1	1
6	1	1	1	1	1	1

-construct evaluative tests

	(1	2	3	4	5	6)
1	1	1	1	1	1	1
2	1	1	1	1	1	1
3	1	1	1	1	1	1
4	1	1	1	1	1	1
5	1	1	1	1	1	1
6	1	1	1	1	1	1

FLUID TRANSMISSION: What value was your program in preparing you to

	<u>no. value</u>					<u>excellent</u>
-demonstrate the concept of Pascal's law	(1	2	3	4	5	6)
-solve problems in area and pressure	(1	2	3	4	5	6)
-demonstrate the concept of pressure	(1	2	3	4	5	6)
-demonstrate principles of flow; and properties of fluids	(1	2	3	4	5	6)
-construct and analyze a single-acting cylinder hydraulic circuit	(1	2	3	4	5	6)
-construct and analyze a double-acting cylinder hydraulic circuit	(1	2	3	4	5	6)
-demonstrate the use and operation of hydraulic valves	(1	2	3	4	5	6)
-demonstrate the principles of pneumatic circuits	(1	2	3	4	5	6)
-construct and analyze pneumatic circuits	(1	2	3	4	5	6)
-construct and analyze fluidic circuits	(1	2	3	4	5	6)
-locate data on fluid transmission-oriented career opportunities	(1	2	3	4	5	6)
-organize and plan to teach the fluid transmission area	(1	2	3	4	5	6)

WOODS: What value was your program in preparing you to

	<u>no. value</u>					<u>excellent</u>
-identify lumber sources and processing methods	(1	2	3	4	5	6)
-comparatively test wood samples	(1	2	3	4	5	6)
-identify and demonstrate common woodworking hand tools	(1	2	3	4	5	6)
-demonstrate common woodworking machines	(1	2	3	4	5	6)
-design, layout and fabricate in wood	(1	2	3	4	5	6)
-demonstrate safety precautions used when fabricating wood	(1	2	3	4	5	6)
-comparatively test hand and machine woodworking tools	(1	2	3	4	5	6)
-sharpen and adjust woodworking tool cutting edges	(1	2	3	4	5	6)
-demonstrate wood fastening techniques	(1	2	3	4	5	6)
-demonstrate wood finishing techniques	(1	2	3	4	5	6)
-locate data on wood-oriented career occupations	(1	2	3	4	5	6)
-organize and plan to teach the woods area	(1	2	3	4	5	6)

<u>PLASTICS: What value was your program in preparing you to</u>	<u>no value</u>			<u>excellent</u>		
-identify plastics sources and production methods	(1	2	3	4	5	6)
-comparatively test plastic samples	(1	2	3	4	5	6)
-identify and demonstrate common plastics handtools	(1	2	3	4	5	6)
-demonstrate common plastic fabricating machines	(1	2	3	4	5	6)
-design, layout and fabricate in plastic	(1	2	3	4	5	6)
-demonstrate safety precautions used when fabricating plastic	(1	2	3	4	5	6)
-comparatively test plastics fabrication methods	(1	2	3	4	5	6)
-adjust plastic fabrication machines	(1	2	3	4	5	6)
-demonstrate plastic fastening techniques	(1	2	3	4	5	6)
-demonstrate plastic finishing techniques	(1	2	3	4	5	6)
-locate data on plastics-oriented career occupations	(1	2	3	4	5	6)
-organize and plan to teach the plastics area	(1	2	3	4	5	6)

<u>ELECTRICITY: What value was your program in preparing you to</u>	<u>no value</u>			<u>excellent</u>		
-demonstrate sources of electricity	(1	2	3	4	5	6)
-demonstrate the measurement voltage, current and resistance	(1	2	3	4	5	6)
-assemble and analyze a heating circuit	(1	2	3	4	5	6)
-assemble and analyze a lighting circuit	(1	2	3	4	5	6)
-identify parts and function of an electric motor	(1	2	3	4	5	6)
-check electric motor operated equipment for adequate grounding	(1	2	3	4	5	6)
-identify electrical safety precautions	(1	2	3	4	5	6)
-assemble and analyze a series circuit	(1	2	3	4	5	6)
-assemble and analyze a parallel circuit	(1	2	3	4	5	6)
-demonstrate electrical control devices	(1	2	3	4	5	6)
-locate data on electrical-oriented career occupations	(1	2	3	4	5	6)
-organize and plan to teach the electricity area	(1	2	3	4	5	6)

HOT METALS: What value was your program in preparing you to

<u>no value</u>	<u>excellent</u>
-identify types of welding equipment	(1 2 3 4 5 6)
-demonstrate oxy-acetelene and arc welding techniques	(1 2 3 4 5 6)
-demonstrate cutting, brazing and silver soldering techniques	(1 2 3 4 5 6)
-comparatively test welding techniques	(1 2 3 4 5 6)
-identify types of foundry equipment	(1 2 3 4 5 6)
-demonstrate pattern making techniques	(1 2 3 4 5 6)
-demonstrate mold making techniques	(1 2 3 4 5 6)
-demonstrate sand casting techniques	(1 2 3 4 5 6)
-design, layout and fabricate a hot metal project	(1 2 3 4 5 6)
-demonstrate safety precautions used when fabricating hot metal	(1 2 3 4 5 6)
-locate data on hot metal-oriented career occupations	(1 2 3 4 5 6)
-organize and plan to teach the hot metals area	(1 2 3 4 5 6)

LAPIDARY CRAFT: What value was your program in preparing you to

<u>no value</u>	<u>excellent</u>
-identify rock sources and processing methods	(1 2 3 4 5 6)
-identify commonly used rocks	(1 2 3 4 5 6)
-comparatively test rock samples	(1 2 3 4 5 6)
-identify and demonstrate common lapidary hand tools	(1 2 3 4 5 6)
-identify and demonstrate common lapidary hand tools	(1 2 3 4 5 6)
-design, layout and fabricate lapidary projects	(1 2 3 4 5 6)
-demonstrate safety precautions used when fabricating lapidary projects	(1 2 3 4 5 6)
-sharpen and adjust lapidary tool cutting edges	(1 2 3 4 5 6)
-demonstrate lapidary fastening techniques	(1 2 3 4 5 6)
-demonstrate lapidary finishing techniques	(1 2 3 4 5 6)
-locate data on lapidary-oriented career occupations	(1 2 3 4 5 6)
-organize and plan to teach the lapidary area	(1 2 3 4 5 6)

COMMENTS

APPENDIX 3

Letters

FACULTY OF EDUCATION
DEPARTMENT OF SECONDARY EDUCATION



THE UNIVERSITY OF ALBERTA
EDMONTON, CANADA T6G 2E1

October 1975.

Dear

As part of my Doctoral work in Secondary Education I am conducting a study designed to evaluate programs that have prepared Alberta's industrial arts teachers. As a practising teacher, you are in a position to assess the effectiveness of the program that you completed.

I realize that many demands are made of you each year and that your free time is limited. However, for this study to be successful it is essential that as much accurate information as possible be obtained. The enclosed questionnaire has been prepared so that only a circle in the appropriate column next to each question is needed. Please note that the intention of this study is to evaluate the teacher education program you completed, not to evaluate you.

Experience suggests that it requires less than 20 minutes to complete the instrument. May I look forward to its return via the enclosed prepaid envelope at your earliest convenience?

Results of the study will be distributed through the Department of Education "Industrial Education Newsletter". Should you want a more detailed abstract of the findings of the study, please add your name in the space provided so I can contact you directly.

Thank you in advance for your co-operation, which will assist in improving our profession by enabling the University of Alberta Industrial Arts Teacher Education program to be further developed.

Sincerely,

Cam J. Ross,

EDUCATION

Telex 037-3400

Executive Building

10105 - 109 Street

Edmonton, Alberta, Canada. T5J 2V2

October 1975

Dear Industrial Arts Teacher:

The multiple activity concept of industrial arts was approved for Alberta schools over ten years ago, at which time the University of Alberta assumed the responsibility for the preparation of industrial arts teachers.

Mr. Cam Ross is investigating the effectiveness of both the University program and also those of other institutions which have prepared teachers for Alberta schools.

As one of the main purposes of evaluation is to improve an existing program, Mr. Ross' research has considerable merit because it aims to locate specific strengths and weaknesses in industrial arts teacher education programs. Such information is valuable, as it can lead to further refinement and improvement of the Alberta program and thereby strengthen industrial arts in our Province.

I therefore encourage you to participate fully in this survey.

Sincerely,

A handwritten signature in dark ink, reading "J. D. Harder". The signature is fluid and cursive, with a long horizontal stroke at the end.

J. D. Harder, Ed.D.
Associate Director of Curriculum

JDH:vrn

FACULTY OF EDUCATION
DEPARTMENT OF INDUSTRIAL AND
VOCATIONAL EDUCATION
TELEPHONE (403) 432-3678



THE UNIVERSITY OF ALBERTA
EDMONTON, ALBERTA, CANADA
T6G 0Y1

January 2, 1975

Dear Colleague:

Last October I sent you a questionnaire concerning the value of your teacher preparation program. To date I have not heard from you, possibly due to the recent postal dispute.

Your response is important as Alberta teachers are providing valuable information which can lead to the further improvement of the Industrial Arts Teacher Education program at this campus.

Would you kindly reply by checking the appropriate statements below and returning this material via the enclosed prepaid envelope? Another questionnaire is provided in case the original has been mislaid.

Please be assured that your response will be treated confidentially therefore your name need not appear on the return.

I look forward to your early reply.

Sincerely,

C. J. Ross

CJR:lk

- ☐ Enclosed is the completed questionnaire
- ☐ I am unable to complete the questionnaire because
- ☐ I do not wish to participate in this survey.
- ☐ Please send me a copy of the results, when available.

B30166